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# MONTANA DEPARTMENT OF FISH AND GAME

# ENVIRONMENTAL IMPACT STATEMENT

# TERMINATION OF LEGISLATIVE DESIGNATION OF THE

# SUN RIVER GAME PRESERVE

Project No. FG-25

December 6, 1972

Game Management Division
Montana Department of Fish and Game

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MONTANA DEPARTMENT OF FISH AND GAME
ENVIRONMENTAL IMPACT STATEMENT
TERMINATION OF LEGISLATIVE DESIGNATION OF THE
SUN RIVER GAME PRESERVE

## OBJECTIVE

The objective is to terminate the Sun River Game Preserve so that better wildlife and wilderness management may result.

## PURPOSE

The intent of this Environmental Impact Statement is to thoroughly examine possible effects of terminating the Sun River Game Preserve to accommodate game management techniques of the Montana Fish and Game Commission. A further purpose will be to explore alternatives and problems associated with a possible total or partial opening of the Sun River Game Preserve to hunting and to reach a conclusion which minimizes any adverse environmental impact. Finally, it will be the purpose of the Montana Department of Fish and Game to present this statement to the public and solicit its fullest possible participation.

## DESCRIPTION OF PROJECT

The Sun River Game Preserve was established in 1913 by the Legislature. (Section 26-1102) Montana Fish and Game Laws. It is the only preserve of considerable size, 199,661 acres, which has not been either abandoned or placed under the control of the Montana Fish and Game Commission. The Montana Fish and Game Commission has the authority by law (Section 26-104, Montana Fish and Game Laws) to set annual hunting seasons in most areas of Montana. The Commission legally describes that during specified dates and within specified areas the taking of certain game animals or birds in a described manner may be done by persons licensed to do so.

Figure 1 shows the location of the Sun River Game Preserve and its position relative to classified wilderness, other lands, road access and adjacent hunting districts 42, 424 and 425. To better understand the impact of the Sun River Game Preserve, a review of history is necessary.

### History of Area

#### Prior to 1900

Numerous artifacts, pictographs and teepee rings indicate the area was a favorite camping ground and hunting site of the Indians. Lewis and Clark explored the lower Sun River and reported it was clear at the mouth in 1805 (Coues, 1893). Cattle were first moved to the plains area in 1862 (Ford, 1935) and by 1890 the foothill region was reported overgrazed by cattle and sheep. By 1886, elk were not noted in the foothills during some years (Great Falls Tribune, 1886, 1889). The first large herds of cattle were moved to the mountainous section of the North Fork of the Sun River in

1890 and the grass was reported to be excellent (Ford, 1935). Loggers and tie cutters worked in the upper Sun River region in the 1880's and 1890's (The Rising Sun, 1889). The loggers worked in the lodgepole pine and Douglas fir forests of Sun River Canyon and on the North Fork of the Sun River. The harvest of timber to provide lumber for growing towns, ties for expanding railroads, and firewood for heating stoves changed the face of the mountain land (The Rising Sun, 1889). Enough trees to make 200,000 ties and 25,000 cords of fuel wood were cut in this locality between 1886 and 1899 (Ayres, 1900). Fire was a major ecological factor in the upper Sun River. A relatively short fire cycle did not permit the accumulation of large amounts of fuel and produced relatively mild fires (Irving, 1971) which contributed to the maintenance of an open lodgepole forest. Major forest fires were recorded in 1889 and 1897.

## 1900-1925

Cattlemen continued to exploit the upper Sun River region. In 1910 a petition calling for the removal of cattle from the upper Sun River was presented to the Forest Service. In 1913 there were 6,560 head of cattle and horses permitted on the National Forest in the Sun River area (Spaulding, 1915). Most of the livestock grazing was for a six-month season. During the same year the Montana Legislature established the Sun River Game Preserve. This area covered 199,661 acres immediately to the east of the Continental Divide. The Legislature eliminated legal hunting within the Preserve. Cattle grazing was terminated in the new Preserve. Numerous cattle continued to graze the National Forest to the east. Hunting seasons for bighorn sheep were closed outside the Preserve in 1913. A total of 965 elk was actually counted in the Sun River area in 1913 (Sperry, 1936). In spite of overgrazing by livestock and with either-sex elk hunting there was a rapid increase in the elk population. In 1917, 1,708 elk were counted and 2,495 were seen in 1925 (Anon, 1965). The growth of forage in burned areas had a very desirable effect on the elk population. By the 1917-25 year period, range abuse was reported (Sperry, 1936) by the rapidly increasing elk herd. Winter die-offs of elk were reported and an estimated 70 percent of the bighorn sheep population in the area died from lack of forage in the winter of 1924-25 (Couey, 1950). Since 1915, professionally-trained personnel and sportsmen began recommending abolition or modification of the Sun River Game Preserve (Picton, 1971).

## 1926-1950

Both domestic livestock and big game animals severely overgrazed the ranges by the 1930's and gullying and sheet erosion were evident (Picton, 1971). The last cattle were removed from the North Fork of the Sun River in 1934 (Anon, 1937). Bighorn sheep and elk die-offs occurred throughout the 1927-1936 period (Picton, 1971). The cattle reductions and the wildlife die-offs permitted the ranges to slowly recover. The improvement was most dramatic outside the Sun River Game Preserve. Inside the Preserve elk continued to abuse the range. Wilderness protection was given to all but the southern portion of the Sun River Game Preserve when the Bob Marshall Wilderness was established in 1940. Conflict between elk and livestock in the 1930's (Mussehl and Howell, 1971) resulted in the establishment of the

Sun River Conservation Council in 1943 (Messelt, 1971) to help resolve the conflict. The Sun River Game Range was purchased in 1947 (Messelt, 1971) to help solve the problems of elk wintering on private range. This purchase provided elk with extremely valuable winter range on public lands in the foothills. It was and is a vital link in the lives of the Sun River elk. Ecological succession and increased fire suppression resulted in increased tree cover and less elk range within the Lewis and Clark National Forest. In summary, during the second quarter of this century many points of major wildlife-cattle conflict were ended and many areas of abused range outside the Sun River Game Preserve started to recover from overgrazing. Recommendations for changes concerning the Sun River Game Preserve continued to be made (Picton, 1971).

## 1951-Present

Either-sex deer seasons were begun in 1951 and soon were expanded into liberal two-deer seasons during most years (Schallenberger, et al., 1970). In 1953, the first bighorn sheep season in 40 years was held (Watts, et al., 1971). During the 1967-1971 period the bighorn harvest through trapping and transplanting averaged 72 animals annually. A quota system for the elk harvest was established for elk in 1955 (Knight, 1970) and the annual elk harvest averaged 621 head for the 1956-60 period (Picton, 1971). Opposition from sportsmen's groups exerted much political pressure in the 1961-65 period and the annual elk harvest averaged only 242 animals (Picton, 1971). The number of calves per 100 cows observed during winter declined from 37 in 1960 to 24 by 1965 (Various authors, 1960-65). Hunter pressure after 1965 was focused on the least harvested segments of the elk population and the cow-calf ratio increased to 40 calves per 100 cows in 1971 (Feist, et al., 1971). The annual elk harvest during the 1966-70 period averaged 424 animals. A cow-calf harvest quota was established in 1967. For the 1967-71 period, 1,399 elk were harvested from a quota of 1,615 cows and calves. The Scapegoat Wilderness was established by Congress in 1972 and in conjunction with the Bob Marshall Wilderness all but 3,560 acres of the Sun River Game Preserve are protected by wilderness law. The United States Forest Service closed the roadless 3,400-acre block of undeveloped land in the Benchmark vicinity to motorized vehicle travel in 1972. Only the 160 acres at the confluence of the North and South Forks of the Sun River remain open to motorized vehicles. A large concentration of elk in the Preserve with a concentration of hunters between the Preserve and winter range creates a condition described as a "firing line" when weather forces the elk from the Preserve across the open area to their winter range.

The firing-line situations (Figure 1) created by the Sun River Game Preserve have been and continue to be a serious threat to proper resource management. Range surveys inside the Preserve have indicated forage is deteriorating especially on key areas of fall range (Various authors, 1955-1971). Similar surveys outside the Sun River Game Preserve indicate that fall ranges are in much better condition, but the animals benefited most are the saddle and pack stock along the firing line. The firing line along the Sun River Game Preserve boundary has forced elk to remain in the Preserve until deep snow, cold weather and lack of forage force them to migrate en masse past waiting hunters to winter range. Elk hunting in the

area has followed the pattern set by the Preserve and the weather. Generally hunting is reasonably good adjacent to the Preserve for the first few days at the beginning of the season. Then most elk are in the Preserve and hunting remains generally poor until severe weather conditions force the elk to move (Knight, 1970). Since 1940, it has been necessary to extend the elk season past December 1, during 22 of 32 years to attempt to obtain the necessary elk harvest. As the elk have begun to migrate, hunters have concentrated along elk migration routes such as Beaver Creek. The hunter congestion and poor sportsmanship that have been evident during these late season shoot-outs along migration routes are indicative of the character of the hunt. The quality hunting which could prevail has not occurred because of the detrimental influence of the Sun River Game Preserve.

## DESCRIPTION OF EXISTING ENVIRONMENT

### Human Resources

The annual resident population within the boundary of the Lewis and Clark National Forest is limited to six guest ranch and resort operators located on the eastern edge of the area. In addition, a caretaker lives just below Gibson Dam on the Sun River and Paul Hazel, an old-time mountain man lives near, or in the Bob Marshall Wilderness the year around.

Utilization of the area by the public is on a transient basis, primarily during the summer and fall months. Backpacking and horseback trips for fishing, sight-seeing and photography provide most of the recreational use in the Sun River Game Preserve at present. Hunters use the area as a passage-way to land open to hunting west of the Continental Divide and to the east of the South and North Forks of the Sun River.

The majority of use by Montana residents comes from the population of surrounding counties whose 1970 census figures are listed below:

| | |
|---|---|
| Teton -- | 6,116 |
| Lewis & Clark -- | 33,281 |
| Cascade -- | 81,804 |
| Pondera -- | 6,611 |

In addition, a number of nonresidents use the area in the summer and fall and many of these persons use outfitter and resort services.

Private and commercial hunting camps are located along the North and South Forks of the Sun River during the entire hunting season. In addition, private cabins at the head of Gibson Lake and campgrounds and cabins in the Benchmark area are also utilized by hunters. Because no hunting is allowed in the Sun River Game Preserve, people concentrate in the area open to hunting adjacent to the Preserve, thus creating an undesirable firing-line situation.

### Physiography and Geology of Sun River Area (Mudge, 1972)

"The Sun River Canyon area is mostly in the Northern Rocky Mountains physiographic province; the eastern part is in the High Plains section of

the Great Plains province. The area is in the Sawtooth Range except for the extreme western part, which is in the Lewis and Clark Range. Much of the western part is in the Bob Marshall Wilderness Area.

The landscape is mainly a series of narrow north-trending mountain ridges of carbonate rock separated by narrow valleys underlain by mudstone and sandstone." The total relief is about 5,112 feet, from 4,280 along the Sun River to 9,392 on Rocky Mountain, the highest peak in the area; "most of the peaks and ridges rise above 7,000 feet. The North Fork of the Sun River is in a relatively broad intermontane valley.

The easterly flowing Sun River and its tributaries are structurally controlled and have fault-trellis drainage (Mudge, 1959). The river is joint controlled, especially where it flows through resistant carbonates, and it is incised along an easterly trending flexure formed by a change in trend of fault blocks.

The bedrock that crops out in the Sun River Canyon area consists of consolidated sedimentary rocks of Precambrian, Paleozoic ages. The aggregate thickness of these sedimentary rocks is about 19,000 feet.

Precambrian rocks crop out only in the western part of the area, where they form the sole of a major low angle thrust fault which marks the east edge of the Lewis and Clark Range. They are overlain by Cambrian rocks. The upper part of the Cambrian sequence also crops out in the central part of the Sawtooth Range. Devonian, Mississippian, Jurassic, and Cretaceous rocks are well exposed in much of the Sawtooth Range. The Devonian and Mississippian rocks are also in some of the mountain ridges west and southwest of the Sun River Canyon area. The sills crops out only in the western part.

The sedimentary rocks are marine except for some Jurassic and Cretaceous rocks, which are continental. Clastic rocks are prevalent in the Precambrian and Mesozoic sequences, whereas carbonate rocks dominate the Paleozoic sequence. Most of the Phanerozoic Marine rocks contain abundant well-preserved fossils, whereas the nonmarine rocks yield few fossils. In many of the units, local and, in some units, regional faunal zones are recognized."

## Land Ownership

Table 1 shows the land ownership for the impact area being discussed. A total of 1,099 square miles is found in the three hunting districts and 312 in the Sun River Game Preserve.

In recent years, a number of land subdivisions have been laid out on parcels of private land both within and outside the National Forest boundary. These sites are being developed for recreational home and cabin sites. Several dwellings have already been constructed on subdivisions at Mortimer Gulch near Gibson Dam and on the Dearborn River. Continued land development of this type will be increasing environmental stress in the Sun River area. Of particular concern will be the effects of development on big game winter range and access to public lands.

Land uses include wilderness, recreation, water production, grazing, timber and minerals.

Table 1. Land Ownership in the Sun River Area

| Land Ownership | Area in Square Miles | | | | |
|---|---|---|---|---|---|
| | Sun River Preserve | Hunting District 42 | 424 | 425 | Total |
| Federal: | (312) | (261) | (203) | ( 16) | ( 792) |
| Forest Service | 312[1/] | 249 | 199 | - | 760 |
| BLM | - | 12 | 4 | 11 | 27 |
| Bureau of Reclamation | - | - | - | 5 | 5 |
| State of Montana: | ( -) | ( 12) | ( 29) | ( 44) | ( 85) |
| Lands Department | - | 12 | 29 | 13 | 54 |
| Fish and Game Commission | - | - | - | 31[2/] | 31 |
| Private | - | 64 | 72 | 86 | 222 |
| TOTAL | 312 | 337 | 304 | 146 | 1,099 |

1/ Includes 40 acres of private land.

2/ Sun River Game Range : Deeded land - 12,173 acres, leased (from BLM) - 4,145 acres, leased (from State Lands Dept.) - 3,410 acres.

NOTE: Land ownership data compiled from U. S. Forest Service and County Soil and Water Conservation District maps.

## Wilderness

One of the most important resources in the Sun River drainage is wilderness. The headwaters of the Sun River contain nearly 315,000 acres of land classfied as wilderness. Three-fourths of this land is in the 950,000-acre Bob Marshall Wilderness which was established by the Forest Service in August, 1940. The remaining acreage lies within the new 240,000-acre Scapegoat Wilderness which was designated as wilderness by Congress in August, 1972. Wilderness was defined in the Wilderness Act (United States Congress, 1964) as an area:

1. "where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain."

2. "of undeveloped federal land retaining its primeval character and influence, without permanent improvements or human habitation."

3. "which generally appears to have been affected primarily by the forces of nature with the imprint of man's work substantially unnoticeable."

4. "which has outstanding opportunities for solitude or a primitive and unconfined type of recreation."

The Sun River portions of the Bob Marshall and Scapegoat Wildernesses are bounded on the west and south respectively by nearly 880,000 acres of additional classified wilderness west of the Continental Divide. The Bob Marshall Wilderness includes 710,000 acres in the Flathead River drainage. The Scapegoat Wilderness contains nearly 160,000 acres in the Blackfoot River drainage. The Forest Service has proposed that an additional 68,500 acres of National Forest land bordering these two wildernesses in the Sun River vicinity be studied for wilderness values.

The portions of the Bob Marshall and Scapegoat Wildernesses on the Lewis and Clark National Forest are characterized by unusual scenery and geology. The massive 1,000-foot limestone cliffs of the Chinese Wall and Scapegoat Mountain were created when mountain-forming forces caused ancient rocks to ride up and over younger deposits. Glaciers worked their way downward toward lower elevations creating erosional landforms such as glacial cirques, hanging valleys and lateral moraines. The array of topography varies from the steep, spectacular heights of the Continental Divide to the more gentle valley bottoms along the Sun and Dearborn Rivers.

Most of the land in the wilderness is forested. The forests predominantly lodgepole pine, result from wildfires since 1885 which burned over 35 percent of the Bob Marshall.

These wildernesses support an abundant and wide variety of flora and fauna. One reference lists 74 species of birds and 142 species of wildflowers (Anon, 1958). All of the big game species common to Montana, except antelope, inhabit the area. The larger animals such as moose, elk, grizzly bear, black bear, mountain sheep, and mountain goat are of great interest to wilderness visitors. Elk hunting in particular has been a key wilderness

recreation use for many years. The Sun River Game Preserve constitutes a major game management problem because it concentrates both hunters and elk in a narrow firing line east of the North and South Forks of the Sun River (Merriam, 1963).

The wildernesses produce large amounts of water. The North Fork of the Sun River, for example, contains 258 square miles of drainage area and produces an average of over 263,000-acre feet of water annually (Anon, 1962). An estimated 75 percent of the water used annually from Gibson Reservoir originates in the Bob Marshall Wilderness (Merriam, 1963).

Outdoor recreation is a growing use in the wilderness. An analysis of Teton and Sun River Ranger District wilderness registration and use records for 1971 shows that approximately 39,000 visitor days (one person for one, twelve-hour day) were spent in the Bob Marshall Wilderness alone. During the summer 85 percent of the use was made by hikers. Most of the people (73%) were residents of Montana. The use pattern changes dramatically in the fall from hiker use to primarily horseback use associated with big game hunting.

Over 98 percent of the Sun River Game Preserve is located within the Bob Marshall and Scapegoat Wilderness boundaries. Two small portions of the Preserve extend outside of the two wildernesses: approximately 3,400 acres in the Deer Creek-Burned Creek area west of Benchmark Guard Station; and 160 acres on the east side of Sun Butte at the confluence of the North and South Forks of the Sun River. The latter area includes the only parcel of private land in the Preserve. This tract of deeded land contains approximately 25 acres on which the Klick Bros. guest ranch is located. The future management of National Forest land within the Sun River Game Preserve will continue indefinitely to be wilderness management. The wilderness resource will continue to be the key resource of the area. The Forest Service must administer this land in accordance with the Wilderness Act which basically means no roads, no motorized vehicle or equipment use, no commercial timber harvest, and prevention of overuse by people and recreation livestock. The wilderness status of the land cannot be changed unless the United States Congress amends the Wilderness Act of 1964.

## Recreation

The National Forest land to the east of the Sun River Game Preserve contains 121 summer homes, six resorts and six commercial outfitter hunting camps. A total of 16 outfitters operate in hunting districts 42, 424 and 425. Ten of the summer homes and one resort lie just east of the Preserve boundary in Arsenic Creek.

There are nine summer homes adjacent to the Preserve boundary in the Benchmark area. Human activity associated with the use of these cabins has some effect on the movement of elk on and off the Preserve.

Six commercial outfitter camps on the east boundary of the Sun River Game Preserve lie on the North Fork of the Sun River and are occupied until the hunting season is closed.

The remaining permitted occupancies on the National Forest do not have a direct influence on the migration of elk from the Sun River Game Preserve although human activity undoubtedly has an influence on range use by big game populations in fall and winter. Other recreation facilities in hunting districts 42 and 424 on National Forest land outside of the Bob Marshall and Scapegoat Wilderness consist of six developed campgrounds, seven picnic grounds, two boat landings and one set of corrals for use by commercial outfitters. Use of these Sun River facilities begins in April and ends with the closing of the hunting season. The peak periods of use are from July 1 to Labor Day and during the hunting seasons.

Additional developed recreation facilities outside the National Forest occur at Bean Lake, Nilan Reservoir, Pishkun Reservoir, the Sun River Game Range and in Augusta and Choteau.

In addition to hunting and fishing, backpacking, horseback riding, boating, water skiing, motorbike riding, driving and photography are recreational pursuits common in the area.

## Water Production

Watershed conditions are generally good in the Sun River Game Preserve, due mainly to a lack of development. Localized problem areas occur where erosion is taking place as a result of heavy grazing, snowdrifts, trails, and normal stream bank cutting. Large fires prior to 1920, and the 1964 flood seriously damaged the preserve watershed, but this damage is being stabilized naturally.

Approximately 60 percent of the drainage area for Gibson Dam lies within the Preserve boundary. Gibson Reservoir has a capacity for 105,000-acre feet of water and irrigates 90,000 acres of farmland.

## Livestock Grazing

Commercial cattle grazing within designated Forest Service allotments is allowed adjacent to the Preserve. At the present time there are eight cattle allotments on the Sun River and Teton Ranger Districts within hunting districts 42 and 424. These allotments support 1,371 head of cattle for approximately a three-month grazing season extending from July 1 through September 30. Nearly all the private lands east of the forest boundary support livestock grazing and some areas are grazed year-long. This is true also for Bureau of Land Management lands and State lands in the area with the exception of the Sun River Game Range. Big game winter range areas, particularly elk and bighorn sheep, are limited outside the National Forest and the Sun River Game Range, due to competition with domestic livestock and intolerance of private landowners.

Range condition and trend data indicates range deterioration on some allotments where livestock and big game animals compete. Deep Creek, Fairview Creek, Little Willow Creek and the Renshaw Lake area are prime examples of poor range condition caused by dual use by livestock and big game. The U.S. Forest Service has indicated game use will be favored on

critical big game ranges.

Although no large scale commercial horse grazing exists in the Bob Marshall Wilderness or the Sun River Game Preserve, range conditions on some of these lands are in a downward trend (Nordberg, 1972). Several grassland areas show moderate to heavy soil losses due to overgrazing and trampling by elk. This is particularly evident at higher elevations where soils are shallow and vegetation is slow in recovering because of the short growing season. Coniferous tree encroachment on old burns and meadows, coupled with fire suppression is reducing available game range over much of the Bob Marshall and Scapegoat Wilderness areas.

Livestock competition on game areas outside the Preserve can be resolved by reducing livestock numbers on key areas. However, no control of abuse by big game on summer-fall range has been possible for some time due to restrictive fire control guidelines and the lack of hunting within the Preserve.

## Timber

Logging is one of the least important land uses due to the growth form of the timber, soil stability limitations, rugged terrain and the scattered stands of commercial quality timber. A limited amount of commercial logging and post and pole cutting has occurred east of the Sun River Game Preserve during the past twenty years. Timber in the Bob Marshall and Scapegoat Wildernesses was deferred from harvest by the Wilderness Acts establishing each wilderness area. A moratorium on all development, including logging, is in effect by the Forest Service on wilderness study areas within the region. Much of the timber in the wilderness areas is mature to overmature and has a high incidence of rot and disease. It is in a condition that would benefit from natural wildfire or controlled burning.

As long as much of the area east of the Continental Divide is classified as wilderness these lands will remain in a timber reserve status and cutting deferred. The status of wilderness established by national law cannot be changed without amendment of the Wilderness Act of 1964 by the United States Congress.

## Minerals

Oil and gas leasing and exploration are the major mineral activities in the area. The current mineral leases and activity is along the Rocky Mountain front outside the Sun River Game Preserve and the Bob Marshall and Scapegoat Wildernesses. A total of 34,894 acres (19 leases) has been leased on the Sun River District of the Lewis and Clark National Forest. A total of 105,621 acres (58 leases) is located on the Teton District north of the Teton River, which is the northern boundary of the discussion area. Humble Oil and Northern Natural Gas are the primary lease holders. Current leases issued during the 1968-71 period are noncompetitive and are issued for a ten-year period which means most of them will expire during the 1978-1981 period.

Other mineral claims and activities are of a minor nature.

## Wildlife

Elk (Cervus canadensis):

Elk are an important big game species inhabiting the Sun River Game Preserve. The area is primarily a spring-summer-fall elk range. The degree to which the Preserve is used in any given year for spring and fall range is weather dependent and varies widely. The elk move to higher elevations as the snowline recedes and spring vegetative development occurs. They reach their high native summer ranges in late spring or early summer. Some movement occurs back and forth across the Continental Divide.

Elk on summer range feed primarily on forbs and grasses. Recent range surveys reveal elk overgraze some of their summer ranges. A major part of the problem involved here is a reduction in acreage of available summer range due to an increase of conifer species in formerly burned areas through natural plant succession. (See the vegetation section for greater detail.)

In the fall, elk begin moving to lower elevations and many may move out of the Preserve across the North and South Forks of the Sun River to transition ranges before the general hunting season begins in mid-October. Depending on hunter activity and weather conditions most of the elk near the Preserve boundary move back inside the Preserve just before or shortly after the opening of the general elk season (Knight, 1970). The elk then feed on available vegetation along the Preserve's east boundary or even move well back into the Preserve if mild weather prevails. As snow depths increase and temperatures become colder, it is common for the elk to move out of the Preserve (especially along the North Fork of the Sun River) at night to feed; returning early the next morning. A few are harvested by hunters during these "food raids." As mentioned, these forays occur mostly along the North Fork of the Sun River because there is little desirable vegetation inside the Preserve in that vicinity due to vegetative succession toward the conifer tree climax. The successional plant stages of palatable bunchgrass and browse species needed by the elk are disappearing. While species such as beargrass and pinegrass are abundant and may appear to furnish much forage, they are relatively unpalatable and little used by the elk.

Large concentrations of elk are found on the lower West Fork of the Sun River and from Deer Creek to the mouth of the South Fork of the Sun River inside the Preserve throughout much of the hunting season. Overuse of the ranges in that area during fall has resulted in range deterioration and a loss of potential winter range for bighorn sheep and elk. (See the vegetation section for a greater discussion of details.) As the available forage is removed in the Preserve "food raids" such as described for the North Fork of the Sun become more common for this area also.

Shifts in elk migration patterns have occurred over the years. More of the elk appear to cross the South Fork of the Sun River and move east in their final migration to winter range. Fewer elk cross the North Fork of the Sun River and move eastward north of Gibson Dam than in preceding decades. Some reasons for this shift may be as follows: more hunters are found along

the relatively open North Fork of the Sun River; the area north of Gibson Dam has had greatly increased activity by man in recent years; an oiled road, cabin development and an increased influx of people using noisy transportation such as trailbikes and snowmobiles has probably influenced elk to change their migration patterns. With the exception of the Beaver Creek Road, the area immediately south of Gibson Dam has retained its wilderness character in comparison with the area north of Gibson Dam. Present elk winter ranges are shown in Figure 2.

Severe conflict exists in some areas with bighorn sheep. Since elk are bigger and stronger, they will win any competition battle with bighorn sheep, so a balance must be achieved between the species. Elk and livestock competition exists on some National Forest, Bureau of Land Management, State Land Board and private lands. The greatest degree of cattle-elk competition exists in the foothill area between the Sun River and the Teton River in hunting district 42.

Current management of the elk herd is directed toward the optimum annual production of elk, regulating the elk population to achieve desired range conditions and optimum relationships with other big game species and domestic livestock. Maintaining quality hunting under the existing constraints is the final management objective.

Present elk hunting is accomplished through a general open season with a cow-calf quota regulating the number of elk taken. The cow-calf quota system has been in effect since 1967. Bulls are not counted in the quota but hunters are asked to check bulls so an accurate tally of the total elk kill is possible.

Records show a total cow-calf quota of 1,615 during 1967-71. Harvest data show 1,399 cow and calf elk taken so the overall cow-calf kill has been under by 216 animals. Total elk harvest during the 1967-71 period has been 2,166 animals. The bull harvest has averaged 35 percent of the total kill. In hunting districts 42 and 424, the quota plan allows bull-elk hunting till the end of the general season if the quota on cows and calves is reached earlier. In hunting district 42, the cow-calf quota has never been achieved by the end of the general elk season due to the influence of the Preserve.

The cow-calf harvest quota is based on the best recent aerial count of elk which is always a minimal elk population figure. Attempts are made to make an aerial survey under optimum counting conditions each winter. Other factors considered when compiling the quota recommendations are range conditions, location of previous elk harvests, the ratio of calves to cows observed during the winter and the percentage of bulls observed in the wintering herd and harvested during previous years.

Mule Deer (Odocoileus hemionus):

It is not known to what extent mule deer use the Preserve land area for summer range. Some do use it. They are migratory as are the elk and probably most move in from the east. They also undoubtedly compete with

the elk and bighorn sheep to an unknown degree on the deteriorating summer ranges for summer forage since studies from east of the Continental Divide indicate the three species use primarily forbs during the late spring and early summer months.

Little hunting of the mule deer takes place west of the foothills area.

White-tailed Deer (Odocoileus virginianus):

White-tailed deer use the Preserve area summering in the lower drainage bottoms of the North, South and West Forks of the Sun River and its tributaries. While a few white-tailed deer winter on the lower elevations of the Preserve, most of the population migrate to lower ranges (such as Sun River Canyon) in winter. Most of the white-tailed deer hunting that is done adjacent to the Preserve in the wilderness is for camp meat. A few trophy bucks are also taken by nonresident hunters. As with mule deer, most of the hunting is accomplished in the foothills and in creek and river bottoms to the east.

Grizzly Bear (Ursus arctos):

Important components of the overall mountain habitat for grizzlies include rock slides, alpine meadows and heavy timber. Snowslide areas are especially important sources of early spring foods. Alpine meadows are used in late summer by grizzlies feeding on vegetation and rodents. Heavily timbered areas furnish security and fall foods such as berries and white-bark pine cones. Grizzlies are opportunists and will eat almost anything. Grasses and sedges probably make up a large portion of their diet, but they will eat carrion, fruits, pine nuts, roots and other animals (Weckwerth, 1971).

The grizzlies that once roamed the plains as far east as the border of the Dakotas, have long since disappeared. They disappeared because they couldn't exist compatibly with man, and were exterminated in those habitats. Any area that furnishes the above described components and is far enough away from man's everyday living routine, currently has grizzly bears. The 950,000-acre Bob Marshall Wilderness area, which includes most of the Sun River Game Preserve, is one of the best such areas in Montana at present. Grizzly bear populations exist over most of the Bob Marshall as well as in the Scapegoat Wilderness Area. Grizzly bear occur in the Preserve because this area includes the required habitat, not because the area is a game preserve.

It appears that the available habitat for grizzly bears is diminishing even in wilderness areas due to natural plant succession toward dense stands of conifer timber. An unknown amount of dense timber is necessary for the grizzly, but his main food sources are vegetative, and they occur in untimbered or sparsely timbered areas. Thus, an interspersion of open, grass-forb slopes intermingled with dense timber is probably necessary for the well being of the grizzly.

Rocky Mountain Goat (Oreamnus americana missoulae):

Goats are probably native to the Sun River area. Information available

on goat distribution suggests they were native to major mountain ranges in western Montana. They apparently were absent in isolated mountain ranges where habitat later proved suitable.

Goats inhabit rugged terrain that often shows well-defined evidence of glaciation. In the Sun River area goat ranges lie between approximately 5,000 and 9,000 feet elevation. Goats tend to make use of the higher areas during summer and move to the lowest elevation with suitable winter range. The reverse has been observed in some locations where they moved up in winter to forage on slopes exposed by wind action.

People hiking or riding in the present Preserve area enjoy seeing goats in their native, cliff-type habitat. Locations in which mountain goats are often observed include the Red Butte vicinity and areas along the Continental Divide which are readily accessible by trail.

Bighorn Sheep (Ovis canadensis):

The bighorn is native to the Sun River area. The past history of the area chronicles intermittent die-offs of sheep due to lack of forage in the 1920's and 1930's. This was the result of intraspecific and interspecific competition with other game species, primarily elk, and livestock before their removal from the present Sun River Canyon area and North Fork of the Sun River in 1934. Some recent U. S. Forest Service management practices have lessened competition for forage with domestic stock along the foothills where bighorns winter.

Studies have shown that the critical winter range of bighorn sheep is usually located at elevations with low snow depths and adequate rocky cliffs for escape habitat. Palatable browse plants, forbs and grasses are all used for food during all seasons. Bighorn sheep migrate to the same areas year after year and even use the same beds (Couey and Schallenberger, 1971).

Portions of the Sun River bighorn sheep herd summer in the Preserve area and more would winter (Figure 2) inside the Preserve (especially at the mouth of the West Fork of the Sun River) if elk competition were not so severe. The majority, however, winter in Sun River Canyon, along the foothill region to the east and north and on the Fairview and Ford Plateau areas (Erickson, 1972).

Under current regulations for harvest and the difficulty of using the trapping and transplanting technique for population control (Watts, et al., 1971), there is fear that the bighorn sheep will overpopulate their range and suffer die-offs similar to those that occurred in the 1920's and 1930's. All bighorn sheep lungs checked in recent years have been parasitized by lungworms. If the sheep suffer malnutrition from overgrazed ranges, the effects of the lungworms are increased and the sheep will die. Areas in the Preserve, at the head of Gibson Lake and in the Deep Creek vicinity, appear to be the most likely candidates for the next die-off of bighorn sheep. This is due to deteriorated range conditions. Elk competition is found in the first two areas and severe cattle competition in the latter area which is mostly on Bureau of Land Management lands.

Currently, the sheep herd living outside the Preserve is managed under a special permit either-sex system. A hunter may shoot any sheep he desires, but with the knowledge there are as many 3/4+ - curl rams in the population as there are permits to satisfy all trophy hunters. To maintain a balance between the sheep population and other game species that use similar forage, female segments of the bighorn population must be removed. Currently this is attempted through trapping and transplanting bighorn sheep to other areas in Montana. However, most suitable habitat in the State has currently been tried, unfortunately with limited success. Thus, to maintain a given herd size in the future, recommendations will call for ewe-only permits in addition to the limited trophy ram hunt. Both sexes of bighorn sheep breed as yearlings and twin lambs are common with good range conditions, so the potential for increase is quite great among bighorn sheep (Couey and Schallenberger, 1971).

Currently, a study is being conducted to ascertain herd segments and seasonal distribution of those segments in the Sun River area. When these facts are determined, smaller, more specific hunting units will be recommended rather than the large, single unit at present.

Moose (Alces alces shirasi):

An occasional moose is reported in the Sun River area, but the incidence of sighting is quite limited. Moose are not hunted in the area at the present time. Unless a change in habitat results in a substantial increase in moose, there are no plans for recommending moose permits for the area.

Black Bear (Ursus americanus):

Montana has a sizeable population of black bear in most of its timbered regions. They are native to western Montana and probably became more numerous in some areas when the grizzly bear populations declined. Their habitat is continuous from western Montana to the wooded foothills east of the Continental Divide.

The Department of Fish and Game conducted intensive studies of black bear in the Whitefish Range of northwest Montana during 1959-66. Bears were found to inhabit spruce-fir areas during the entire year, but to make seasonal use of other habitats whenever certain foods became abundant. They appear to thrive best wherever human habitation, logging or agriculture have not significantly altered their environment.

Black bear in the lower spruce-fir type had small seasonal movements. Female home range size was about two-square miles and male home range size was about 12-square miles.

Black bear eat a variety of grasses, sedges and forbs as soon as they emerge from their dens. Fruits, pine nuts and berries are also an important part of their diet during summer and fall (Weckwerth, 1971).

Although the Sun River area has a sizeable black bear population, harvest records for recent years show relatively few are taken by hunters (Watts, et al., 1971). During years of poor food production, the bears are forced to forage more extensively. Being more vulnerable to hunters black bear harvest increases.

Mountain Lion (Felis concolor):

The mountain lion is native to the area. Little, however, is known about the lion population in the Sun River area. At present several are killed in the vicinity each year. Mountain lion were given the status of game animal in 1971. Prior to that time they survived the bounty system and year-round hunting as a predator species. Currently mountain lions are managed under a free permit system with one lion allowed per hunter per year.

Game Birds:

All three species of forest dwelling grouse -- blue, (Denragapus obscurus), ruffed (Bonasa umbellus), and spruce (Canachities canadensis franklinis) -- found in Montana reside in the Preserve and adjacent areas. Research has shown that the mountain grouse harvest in more accessible areas in Montana is minimal and has little effect on the grouse populations (Mussehl et al., 1971). Most of the grouse hunting in the relatively inaccessible Sun River backcountry is incidental to big game hunting.

White-tailed ptarmigan (Lagopus leucurus) inhabit alpine and subalpine areas on some of the higher mountain ranges. Habitat in alpine areas is typically an interspersion of snow, precipitous slopes, rocky areas and ledges, and glacial cirques. They usually occupy areas above timber-line at all seasons. The ptarmigan was given game bird status in 1931; however, seasons have remained closed on the species (Chrest, 1971). From the description of their habitat, it is obvious that ptarmigan hunting would be very difficult if an open season was declared.

Waterfowl:

Several species of diving and dabbling ducks nest in the area and are found throughout most of the spring and summer. Other incidental use by ducks and geese occurs during annual migrations, but the area is too inaccessible to be popular for waterfowl hunting.

Furbearers:

The Sun River Game Preserve is currently open to trapping but little is known to occur. All the major furbearing species are present including the mink (Mustela vison), beaver (Castor canadensis), muskrat (Ondatra zibethicus), otter (Lutra canadensis), marten (Martes americana) and probably the fisher (Martes pennanti) since its reintroduction into Montana in 1959. The last two species, unlike many of the other furbearers which live close to water, are closely associated with climax spruce-fir forests (Mitchell, et al., 1971).

Predatory Animal Species:

Species common in the area include the coyote (Canis latrans), weasel (Mustela spp.), skunk (Mephitis mephitis), bobcat (Lynx rufus). Other species listed as predators by the Montana Legislature and occasionally reported

include the wolverine (Gulo gulo) and the wolf (Canis lupis). The latter animal is very rare in an area where it was quite common at one time. Other animals present but not classed as either predators or furbearers by the legislature include the red fox (Vulpes vulpes), lynx (Lynx canadensis), raccoon (Procyon lotor), and badger (Taxidea taxus).

Many small mammal and rodent species also inhabit the area and furnish food for the various animals and birds of prey. The smaller animals provide enjoyment for observers passing through the wilderness area. None of the species are known to be inhabitants of only the Preserve area.

Bird Species other than Game Birds and Waterfowl:

A wide variety of song bird and avian predators, including both species of eagles, are present in the Preserve and the surrounding areas for portions or all of the year depending on the species. Most of the species on check lists of Montana (Davis, 1972) birds that have the required habitat types probably live in the Preserve. Most species are protected by both State and Federal Laws.

Fish:

Four game fish species occur in the area under concern: native cutthroat trout, an introduced species of Yellowstone cutthroat trout, rainbow trout and brook trout. In streams, rainbow trout are most common, followed by brook trout and native cutthroat trout. Yellowstone cutthroat trout are found in a few high mountain lakes (Hanzel, 1959) (Hill, 1971). The area is open to fishing during the regular fishing season, and most of the pressure and success occur on the three major forks of the Sun River -- the North Fork, the South Fork and the West Fork. Some of the tributaries have fish populations but are of lesser consequence than are the major forks listed above.

## Vegetative Resources

The general vegetation zones roughly follow the sequence described for central Montana (Larson, 1930) with transition from prairie to juniper-limber pine with a subalpine forest of Engelmann spruce, alpine fir and whitebark pine at higher elevations (Knight, 1970). Bunchgrass grassland covers approximately 8,000 acres on the Sun River Game Range and another 7,000 - 8,000 acres are found in the mountain valleys to the west. Additional areas of mostly private land contain grassland along the foothills to the north and south of the Sun River Game Range. There is less elk use on these private lands, especially to the north.

Four types of grassland were recognized by Knight (1970) as follows: Agropyron-Festuca, Stipa-Festuca, Danthonia-Festuca and Potentilla-Festuca. The two latter types represent a retrograde succession created by heavy grazing pressure and are especially noticeable on areas receiving heavy past grazing from livestock, both domestic and wild.

A transitional zone above the grassland along the east face of the

mountains supports an open limber pine savannah where the soil is underlain by sandstones.

Timber communities have been described by Picton (1960) and Schallenberger (1965). Quaking aspen groves are interspersed with grassland on the more moist sites throughout the area. Relationships with grassland and understory are essentially the same as described by Lynch (1955) for Glacier County north of the discussion area. A lodgepole pine-aspen type often occupies early stages of successional sites, later to be dominated by lodgepole pine and later Douglas-fir or alpine fir. The understory of the lodgepole-aspen pine type produces more game forage than the lodgepole type. This latter type has an understory grading from an almost barren carpet of pine needles to dense stands of pine grass, a species relatively unpalatable to wildlife. Lodgepole pine is a seral stage which occurs following fires, and it precedes Douglas-fir or alpine fir. Young firs are common in most stands.

The Douglas-fir type is found along drainage bottoms at lower elevations and is often associated with scattered lodgepole pine. Pinegrass is a major understory species. In the closed canopy subalpine forest, Engelmann spruce is the dominant tree in association with alpine fir and frequently whitebark pine. The open canopy subalpine forest is characterized by more open stands of Engelmann spruce and alpine fir, often with Douglas-fir, lodgepole pine, limber pine and whitebark pine. Beargrass and low huckleberry dominate the understory with interspersed forbs. A variety of open areas of great importance to wildlife are also present. Old burns occur within the lodgepole pine, Douglas-fir and subalpine forest. The years of 1889, 1897, 1910 and 1919 were good fire years and much of the present open areas resulted from these burns. Indeed, it would be very difficult to discover a part of the area which had not been burned at one time or another. Large areas at higher elevations are dominated by beargrass and low red huckleberry similar to the understory of the subalpine forest. Some areas at high elevations are dominated by a forb type which grades into the beargrass and subalpine forest. Other habitat types include the bottom type found along creeks, river bottoms and in poorly drained meadows. The type is characterized by lush herbacious growth.

In summary, most of the Sun River Game Preserve is covered with a dense tree canopy especially from the West Fork of the Sun River to the south and from Moose Creek to the north end of the Preserve. Relatively open areas include the head of Moose Creek, the West Fork of the Sun River, the Prairie Reef vicinity and small cirques at the heads of drainages adjacent to the Continental Divide. Grazing animals and vegetative resources are inseparably tied together. Past overgrazing is reflected by the presence of plant species which are less palatable for game animals and livestock. The presence of exotic species such as timothy and orchard grass in the Bob Marshall Wilderness is the result of reseeding attempts after the range was devastated by overgrazing.

Working in conjunction with the United States Forest Service, the Montana Department of Fish and Game conducts surveys to determine the condition of big game ranges in the area. Plant use measurements in the Sun River Game Preserve

over a period of years (Table 2) show that the ranges are being severely overgrazed, especially during the fall (Various authors, 1955-1971). The firing-line situation along the Preserve boundary forces the elk to remain in the Preserve until practically all the available and palatable bunchgrass is eaten. This has resulted in a deteriorated range condition as attested by measurements using the Daubenmire plot system (Table 3) (Daubenmire, 1959). The ranges within the Preserve show low production and viability of bluebunch wheatgrass, rough fescue and Idaho fescue. Less desirable grass species such as the bluegrasses and Junegrass are much more common than on the most heavily grazed winter ranges outside the Preserve on the North Fork of the Sun River. On the North Fork of the Sun River most of the open parks north of Elk Hill cannot be used by elk during most winters because snow depths are too great. Likewise, much of the flatland area south of Elk Hill is not used except in the most mild winters. Horses and mules of hunters and outfitters are the only animals receiving much benefit from the fall range on the North Fork of the Sun River at present.

Recent surveys have shown that elk are overusing vegetation on summer ranges (Nordberg, 1972). Since most of the elk summer at higher elevations it is apparent that overgrazing and trampling could easily damage the fragile soils and plants which have a very short growing season at high elevations. Good nutrition on summer ranges is necessary for the best reproductive performance of game animals (Julander, et al., 1961).

The problem of overgrazing on summer range is tied directly to the control of forest fires over the past 50 years. Old burned areas have revegetated with conifers, which results in a drastic decrease in productive big game habitat. Few large forest fires have occurred since 1920 and consequently, little significant game habitat has been created since then.

The existing pattern of vegetation types in the Sun River country clearly reflects the influence of large wild fires early in this century. Table 4 shows acreages burned during that period as determined from Forest Service records of fires over 20 acres in size.

Several large fires in 1910 accounted for over 72,000 acres of the burned area, much of it in the Sun River Game Preserve. Two large fires in 1919 burned in excess of 25,000 acres. Other years in which fires of over 1,000 acres in size occurred were 1916, 1917, 1921, 1929, 1936, 1940, and 1945. Approximately 1,500 acres of the total area of fire occurrence has been burned over twice since 1910 (Figure 3).

Fire records show a dramatic decrease in acreages burned during the past 25 years. A 2,270-acre fire at Benchmark in 1945 was the last large fire recorded in the area. Not a single fire of over 20 acres in size occurred during the decade of the 1960's. The major decrease in burned area is due mostly to continual improvement in fire detection and suppression techniques. Areas with a potential for carrying large fires currently exist, especially within the Sun River Game Preserve.

Some high elevation areas which were burned in the past are still poorly stocked with conifer reproduction due to the severe climatic

Table 2. Grass utilization measured on dried plant material inside and outside Sun River Game Preserve, 1967-1972

| Transect Number and Location | Species | 1972 | 1971 | 1970 | 1969 | 1968 | 1967 | Average |
|---|---|---|---|---|---|---|---|---|
| Inside Sun River Game Preserve: | | | | | | | | |
| West Fork Sun River 101 | Feid | 91[1]/72[2] | 97/78 | 95/76 | 100/81 | 98/80 | 91/72 | 95[1]/76[2] |
| West Fork Sun River 102 | Feid[3] | 100/80 | 98/79 | 86/68 | 100/81 | 99/81 | 95/76 | 96/77 |
| Furman Creek 12 | Feid | 95/76 | 89/71 | 86/68 | 87/69 | | | 89/71 |
| Furman Creek 11 | Agsp[4] | 96/77 | 100/80 | 91/72 | 94/76 | | | 95/76 |
| Outside Sun River Game Preserve:[5] | | | | | | | | |
| Elk Hill NF-1 | Feid | 67/52 | 63/48 | 73/57 | 64/50 | 95/76 | 54/40 | 68/53 |
| | Agsp | 58/44 | 49/36 | 83/66 | 64/50 | 93/73 | 70/54 | 69/54 |
| Terrace Hill NF-2 | Feid | 69/53 | 74/58 | 79/62 | 67/52 | 90/72 | 73/56 | 78/59 |
| Circle Creek Flat NF-3 | Feid | 44/21 | 7/ 1 | 23/13 | 43/32 | 90/72 | 64/50 | 45/31 |

1/ Number of plants grazed per 100 measured.
2/ Per cent weight of bunchgrass plants utilized.
3/ Feid = Idaho Fescue.
4/ Agsp = Bluebunch wheatgrass.
5/ Transects on sites used as winter range for elk. Fall use by elk is much less outside preserve.

Table 3. Composition and condition of range from two by five decimeter plots, twenty plots per transect [1]

| Location | Partial List of Species | Per cent Frequency of Occurance | Per cent Canopy Coverage |
|---|---|---|---|
| Inside Sun River Game Preserve [2] | Soil | 79 | 34 |
| | Club Moss | 59 | 31 |
| | Bluebunch wheatgrass | 50 | 05 |
| (4 Transects West Fork and Furman Creek) | Idaho Fescue | 49 | 05 |
| | Rough Fescue | 26 | 06 |
| | Bluegrass | 75 | 11 |
| | Junegrass | 66 | 08 |
| | Phlox, Pussytoes, Ballhead Sandwort, Fringed Sagewort | 23 | 03 |
| Outside Sun River Game Preserve [3] | Soil | 70 | 34 |
| | Club Moss | 63 | 28 |
| (2 Transects Elk Hill Vicinity) | Bluebunch wheatgrass | 77 | 22 |
| | Idaho Fescue | 85 | 35 |
| | Rough Fescue | 15 | 12 |
| | Bluegrass | 35 | 07 |
| | Junegrass | 38 | 06 |
| | Phlox, Pussytoes, Ballhead Sandwort, Fringed Sagewort | 30 | 03 |

1/ All transects are on south-facing slopes or ridge tops at about 5,500 feet elevation.

2/ Transects used by elk in fall. Potential winter range locations if not grazed so heavily in fall.

3/ Winter range receiving most use by elk on North Fork of the Sun River. Much potential fall range outside Preserve not used by elk.

Table 4. Acreages burned as determined from Forest Service fire records during period, 1910-1970[1/]

| Period | Sun River Preserve | Hunting Districts 42 | 424 | 425 | Total |
|---|---|---|---|---|---|
| 1910-1920 | 69,900 | 26,800 | 4,400 | 600 | 101,700 |
| 1921-1930 | 350 | 1,000 | 1,250 | --- | 2,600 |
| 1931-1940 | 100 | 1,900 | 3,050 | --- | 5,050 |
| 1941-1950 | --- | 300 | 2,400 | --- | 2,700 |
| 1951-1960 | 400 | 100 | 350 | --- | 850 |
| 1961-1970 | ------ | --- | --- | --- | ----- |
| Total | 70,750 | 30,100 | 11,450 | 600 | 112,900 |

1/ Acreage figures totaled to nearest 50 acres.

limitations of those sites. A very slow rate of timber regeneration is also apparent on the limestone reefs along the mountain front due to droughty soils and exposure to the strong, prevailing west winds. However, brush and tree cover is gradually filling in on most of these sites.

The more favorable timber growing sites within the old burns are moderately to heavily stocked with sapling and pole size lodgepole pine reproduction. The present average size of trees in these young stands is related more to the density of the stand than it is to age. The more heavily stocked young lodgepole stands contain very little understory growth. In the less densely stocked areas, the understory vegetation is gradually decreasing as the tree canopy closes. There is also an apparent invasion of tree reproduction, mainly Douglas-fir and limber pine, into some of the mountain grasslands.

The map in Figure 4 shows the general vegetative pattern in the Sun River area at the present time. This information was prepared from aerial photographs, timber inventory data, and mapping of ecological land units completed during 1971 and 1972 by Forest Service personnel. A brief description of these map units and their relative value as habitat for big game animals follows:

Dense Forest - This unit includes areas of old growth forest and well stocked stands of young lodgepole pine. The unit provides cover for elk, deer, and bears. It also provides limited forage for deer and elk on spring-summer-fall ranges, primarily adjacent to grasslands and open forest areas.

Mountain Grassland - Areas dominated by grasslands with some pockets and stringers of timber present. Conifer reproduction is invading on some of these sites and aspen groves are frequently associated with the grasslands. The unit provides important transitional ranges in spring and fall months for elk, deer and bighorn sheep. These species also make some

summer use of the grassland areas. Limited portions of the mountain grasslands provide winter range for elk and bighorn sheep, although areas where forage is available are very restricted during periods of severe weather. Bears use the grasslands extensively in the spring.

High Plains - This unit is comprised of the open country and relatively gentle terrain extending eastward from the mountain front. Tree cover is limited to scattered stands of conifers along the mountains and riparian vegetation along the main drainages. The portions of this unit adjoining the mountains provide important winter ranges for elk and deer. However, these animals stay near the timbered fringes, moving out into the open country only when forced there by severe weather conditions.

Open Forest and Barren - This unit includes the open-growth, high elevation forests, alpine vegetative types, and burned areas at all elevations where site conditions result in slow vegetative succession following fire. There also occur areas of limestone reefs, talus slopes and timberline rocklands supporting little or no vegetation. A few small pockets or narrow stringers of dense forest are interspersed in this area. Some mature Douglas-fir stands occur on drier sites. This country provides year-round habitat for mountain goats and bighorn sheep. It is also the area which provides the most favorable grizzly bear habitat. Mule deer and elk utilize this unit extensively during the summer and early fall period. The burned-over areas on limestone reefs along Gibson Reservoir and the lower Sun River Canyon provide winter range for elk, deer and bighorn sheep.

## Climate

Climatic conditions within the area vary due to the wide range of elevations and topographic features. Prevailing weather patterns develop from the west, giving rise to general downslope wind conditions. Weather information is taken from the U. S. Weather Bureau Station at Gibson Dam in the Sun River Canyon at an elevation of 4,590 feet.

A summary of the monthly temperature and precipitation records taken from the 25-year average (Gibson Dam, U. S. Weather Bureau, 1960) follows: precipitation averages 17.24 inches annually with over one-third falling during May and June. The mean annual temperature is 41.7° F. January is the coldest month with a mean temperature of 22.7° F. and July the warmest month with a mean of 62.4° F. (Knight, 1970).

Within the mountainous area, the ground is usually snow covered from November through April, but snow depth varies with elevation and topography.

Figure 5 shows the 10-inch average precipitation isolines for the area for 1953 through 1967. The data were obtained from snow survey measurements and precipitation gauge measurements by the Soil Conservation Service.

A summary of snow survey measurements taken by the Soil Conservation Service and the United States Forest Service is shown in Table 5. The March 1, readings for all locations are above 5,000-feet elevation and do not reflect snow conditions over the entire area (Knight, 1970).

Table 5. Average depths of snow courses in inches on March 1, 1949 to 1965 at five locations in the Sun River Area

| Location | Elevation | Snow Depths |
|---|---|---|
| Cabin Creek | 5,400 | 26.9 |
| Five Bull | 5,700 | 21.9 |
| Wrong Creek | 5,700 | 46.4 |
| Goat Mountain[1/] | 7,000 | 38.2 |
| Wrong Ridge | 6,800 | 59.7 |

1/ Also known as Sheep Mountain and is the only location in the Sun River Game Preserve.

The region lies within the "chinook" belt of the Rocky Mountains and the weather is often characterized by strong west winds often exceeding 40 miles per hour. This is especially true on the face of the mountains and in the westward trending canyons. The transition from foothills to mountains is generally abrupt, with sheer cliffs rising to 3,000 feet above the surrounding country. That portion of the area east of the mountain face is subject to much more pronounced downslope wind conditions the area within the mountains and receives less snow. The snow that falls in the foothills rarely persists more than three days without a general removal and redistribution in drifts by strong west winds (Knight, 1970).

## Transportation System

Augusta is the principal highway access point to the Sun River Game Preserve. It is served by State Highway 287 from the North and South and State Highway 21 from the east. Two gravel roads west of Augusta go to within seven miles of the Preserve boundary in Sun Canyon and to the Preserve boundary at Benchmark. Gravel roads extend through Beaver Creek and up the North and South Forks of the Teton River. Access within the Preserve is by 247 miles of trail. (See Figure 1 and 6 for details.)

Road access to Benchmark and the West Fork of the Teton River is usually stopped about November 20-30 due to snow. Sun Canyon and the remainder of the Teton River road system remain open without plowing approximately two to three weeks longer due to elevation differences. All trail passes are usually snowed in by November 1, with the exception of headquarters and Route Creek which are usually blocked by snow earlier.

Access to the west of the Preserve is entirely by trail. The closest road access is about 24 airline miles west at Holland Lake. Access from the north and south is also by trail. Besides the roads to Benchmark, Sun Canyon and Beaver Creek, the area immediately east of the Preserve has 366 miles of trail in hunting districts 42 and 424.

Great Falls International Airport is served by four major airlines. The Benchmark Airstrip, paved and within one mile of the Preserve boundary, will accommodate multi-engine aircraft; however, there are no facilities other than parking and tie-downs. A paved airstrip is located at Choteau, but commercial airline service is not available. Augusta has a grass airstrip suitable for single engine aircraft.

Choteau and Augusta are served by freight trains of the Burlington Northern Railroad.

## Utility Systems

Except for electrical and telephone systems on the eastern edge of the project area, utility systems are not part of the existing environment. Communications in the vicinity of the Sun River Game Preserve are limited to radio telephone at Klick's Dude Ranch, Gates Park and Benchmark Forest Service Stations, and Department of Fish and Game and Forest Service shortwave radios. Most of the area receives AM radio broadcasts from nearby cities, and most hunting camps possess small transistor radios. Urgent messages such as hunting season closures are delivered by horseback riders contacting hunters in the camps.

# EVALUATION OF ENVIRONMENTAL IMPACT

It is not possible to evaluate the environmental impacts associated with big game hunting seasons without considering the relationships of the animals to their environment. A discussion of these relationships is essential preceding meaningful interpretation of the Sun River Game Preserve impacts, both adverse and desirable.

Big game populations have the biological capability to reproduce their numbers to a level that exceeds the capacity of the habitat to provide forage and space. In Montana, the forage restriction is most obvious during the winter season, but it is significant during other seasons as well. If game populations are not adequately controlled, the inevitable results include depletion of forage resources, extensive animal losses and lowered reproductive performance (production and survival of young animals). During the interval when excessive populations exist, the vegetation and soil resources can be and have been damaged to the degree that the carrying capacity of an area is drastically reduced for indefinite time periods. Lesser consequences include the loss of the animals, increased opportunities for depredation by game animals on man's domestic crops due to lack of native forage and the opportunity for forage competition with domestic livestock and other big game species.

The impact that big game populations can have on their ranges has been recognized and documented in numerous locations in Montana and surrounding areas (Anon, 1972).

Big game malnutrition, starvation and range deterioration were recognized as problems on the Northern Yellowstone elk herd winter ranges as early as 1892. The problem was complicated by many factors that restricted

use of historical ranges such as settlement of these lands and conversion to farms and livestock ranches. All hunting was prohibited in the Park by 1883 and controlled outside Park boundaries by the states. By 1914, the herd had multiplied to the point where the remaining winter range was stocked with about 35,000 elk. While malnutrition and some starvation has been observed each winter, during the winter of 1919-1920 about 14,000 elk died of starvation. During succeeding years, a variety of practices were employed to control the population within the park. The two primary means included direct reduction and transplanting of live animals. Since the capacity of the range was reduced due to too many elk, population levels to date have not achieved those of previous years. The history of this population clearly documents the potential for unchecked big game populations to destroy their ranges and materially reduce the capacity of the range to support grazing animals.

The history of the Gallatin elk herd and its relationship to habitat is well documented (Lovaas, 1970). Similar to the Yellowstone elk herd, the Gallatin herd has had a history of major disturbance by man including livestock grazing on ancestral ranges, settlement of range used by elk, removal of natural predators and inadequate regulation of population surpluses. The entire management picture has been complicated by Yellowstone Park providing an unhuntable sanctuary for parts of the herd during hunting seasons with mild weather. Habitat was drastically damaged by too many animals, and range carrying capacity noticeably reduced. Several decades of management efforts have been required to reverse the downward trends in range and population condition. Means are not available to predict the time that will be required to restore fully productive condition to the area. The problem could have been alleviated (at least to a major extent) by proper regulation of grazing animals. Major reasons for inadequate population control include lack of demand for the animal, disruption of natural habitats by man's cultural practices, control of natural predators, control of wild fires that can create habitat, and overrestrictive regulations resulting from sincere but misguided attempts to protect the animal while disregarding habitat relationships.

This type of thinking resulted in part from an era when game populations were exploited by the meat and hide hunters. People were, and continue to be, concerned with the numbers of animals they can see, and disregard the habitat. Precise population numbers are often not obtainable, but it is possible to measure the habitat and the effects of good habitat in terms of animal health. It has been repeatedly shown that reproductive performance of big game animals can be many times higher on healthy habitat than on poor habitat. Age-ratio data for game populations throughout Montana verify this fact. Survival and condition of animals on poor range is not good. Those on healthy range are bigger, and the males have superior antlers and horns and are better animals in every respect.

In recognition of the impacts that big game populations can have on their environment, the Department of Fish and Game uses numerous methods of monitoring habitat, population and harvest relationships. At present, 57 vegetation plots have been established in the Sun River area to monitor condition and use of vegetation by game and livestock populations so that

impacts on soil and vegetation are known. In addition, the United States Forest Service maintains plots to check habitat relationships. Population parameters are measured through use of standard survey techniques to provide information on population dynamics and trends. Harvest results of hunting seasons are measured through the Augusta checking station, hunter questionnaire surveys and records kept by outfitters. The information obtained from the aforementioned studies provides a basis for establishing hunting regulations that allow for maximum use of annual surpluses of game populations, that provide maximum quality hunting opportunities for all game, and that enable balancing big game populations with existing forage supplies.

## Environmental Impact of Sun River Game Preserve

### Human Resources

Eliminating the Sun River Game Preserve and permitting the opening of hunting seasons for several or all game species will have the following impacts on the human resources of the area: The unduly long elk hunting seasons at present will probably be shortened to a regular length hunting season similar to that found in other areas of Montana. Some local businessmen may feel that their business will suffer from a shorter elk season. Likewise their businesses will suffer if the elk populations destroy their habitat within the Preserve, and elk numbers decrease. High mountain ranges take a long time to recover and so will the elk population.

If the Preserve is opened to hunting there will be less frustration for many hunters who at present can see elk in the Preserve but cannot hunt them. At present, hunters make many, often futile, attempts outside the boundary and contribute to the firing-line situation adjacent to the boundary.

Opening the Preserve to elk hunting will remove the firing-line situation along the Preserve boundary and negate the firing line in Beaver Creek. When the elk are migrating, the latter area is a definite hazard to human safety and people compete not just with elk, but other hunters as well. If the elk could be dispersed over their fall ranges, effective regulations could be established to prevent the vehicle and people traffic jams that occur when elk are migrating through Beaver Creek.

If the Preserve status is terminated and portions or all of it are opened to elk hunting, an influx of people will result the first year unless the season is closely regulated. (See the wilderness, recreation and short-term-long-term management sections for further information on this impact.)

### Impact on Physiography and Geology

Opening the Sun River Game Preserve to hunting will increase horse use of the area. There will be increased erosion of the Forest Service trails, particularly those that receive little or no use at present. The erosion potential can largely be regulated by public education and careful law enforcement by the United States Forest Service. The hazard is minimal

when compared to the potential damage that large congregations of elk can cause in areas such as the lower West Fork of the Sun River. Hunting would result in better elk distribution and decrease soil damage caused by concentrations of elk on fall range.

## Impact on Land Uses

### Wilderness

At present, wilderness quality is high in the Sun River Game Preserve, but is being reduced by the concentration of people along the Preserve boundary and the resulting firing-line situation. Opening the Preserve to hunting will result in greater use by horses and people and the possibility does exist for overgrazing by horses. Overuse by people and their recreation livestock could be reduced to a minimum through public education, administrative restrictions and effective law enforcement. The Wilderness Guard program used by the Forest Service is a very worthwhile management system and if necessary it could be expanded. Overall, opening the Sun River Game Preserve for hunting will be beneficial to wilderness management. Dispersal of hunters from the east Preserve boundary would help fulfill the Wilderness Act of 1964 which states in part: "Wilderness is an area which has outstanding opportunities for solitude or a primitive and unconfined type of recreation" (United States Congress, 1964).

Public discussion of the Sun River Game Preserve and the Bob Marshall and Scapegoat Wildernesses will result in increased people use of the area even if the Preserve is not opened to hunting. The magnitude of the increase will depend upon how much statewide and national media coverage the area receives. Wilderness managers should be prepared to handle the increased visitation and to protect wilderness values.

## Impact on Recreation

The greatest impact of the Sun River Game Preserve is on elk hunting. The firing-line situations and the long elk seasons occurring since 1940 have been discussed previously. Opening the Preserve to elk hunting would reduce or eliminate both of the above factors.

The use of commercial outfitter camps, resorts, summer homes and private camps during the hunting season along the Preserve's eastern boundary intensifies the firing-line problem and forces the elk to remain in the Preserve until late in the fall. At present, some of the summer homes in close proximity to the wilderness boundaries are being phased out and will probably be eliminated in the future in favor of public use. The hunter activity associated with the other facilities will still remain a problem.

Many outfitters who strive to offer quality hunting agree that the Preserve should be opened for elk hunting under closely regulated conditions. Others violently oppose opening the Preserve to hunting because it will mean competition from hunters who will not contribute to their economy. The United States Forest Service does not foresee any additional outfitter permits for the area if the Preserve is opened to hunting. In fact, no additional

outfitter camps will be allowed in the Sun River area according to the Forest Service.

Camping by private individuals will come under closer regulation in the wilderness areas in 1973 regardless of whether or not the Preserve is opened to hunting. The Forest Service will begin enforcing a 14-day maximum camping limit for private campers in 1973 according to the Bob Marshall Wilderness Plan (Richmond, et al., 1972).

If the firing-line situation continues to damage the wilderness values along the Preserve boundary, it is possible to predict that in the not too distant future, the Forest Service will be issuing people use permits during the hunting season to control human use for protection of the wilderness resource outside the Preserve.

## Impact on Water Production

Modification of the Preserve would have a beneficial impact on the production of quality water through accommodating better range management.

## Impact on Air

Increased use of the Preserve by hunters could result in increased smoke from campfires. Few campfires are made in the Preserve at the present time. Increased use by people could mean an increased chance for forest fires. Both problems would appear to be minor, however. Conditions for spread of forest fires are not optimum throughout most of the hunting season. As was pointed out previously, forest fires have a natural role in the environment often providing suitable elk range.

## Impact on Livestock Grazing

Opening the Preserve to hunting would decrease the long grazing season for saddle and pack stock along the Preserve boundary since extended seasons would frequently not be necessary to obtain the elk harvest. Elk would be able to use natural fall ranges east of the Preserve in many areas that are being used almost entirely by recreation livestock at present.

If the Preserve is opened to hunting, close regulation of horses and mules would be necessary to protect the ranges which in many cases have been abused by elk. Few sites for suitable horse camps exist within the Sun River Game Preserve, particularly at higher elevations. Unless fires restore some of the open area and associated bunchgrass plant communities on some sites, recreation stock use of the Preserve will need to be controlled. For example, horse users may be required to pack in the necessary feed for their horses. The types of feed that could be packed in may also be restricted to pelletized rations to prevent introduction of exotic plant species in the area.

Greater use of fall ranges outside the Preserve by elk could mean less competition with cattle for forage on private land in the foothills. Improvement of range condition in the Preserve, (now totally grazed by elk in the fall) could create additional winter range for elk and bighorn sheep.

## Impact on Timber Harvest

A change in the Sun River Game Preserve would have little impact on the timber values of the area. All but 3,560 acres of the Preserve is managed under the constraints of the Wilderness Act of 1964. The United States Forest Service has closed the roadless 3,400-acre block of wild land in the Benchmark vicinity to motorized vehicle travel. Public opinion would most likely prevent any attempt to log the above area or the 160 acres at the mouths of the North and South Forks of the Sun River.

## Impact on Minerals

Opening the Sun River Game Preserve to hunting will have no effect on mineral exploration or leasing in the area. The continued existence or termination of the Preserve will have little influence on the outcome of conflicts with oil and gas interests to protect the wilderness environment so important for many big game species.

## Impact on Wildlife Species

Elk:

Opening the Preserve for elk hunting could result in an influx of elk hunters for the first year or two until hunters realize the environmental factors of rugged topography and dense timber with which they must compete. (See suggestions to alleviate this impact under short-and-long-term management.)

Some people fear that the elk will be forced out of the area never to return if the Preserve is opened for elk hunting. When tha adjacent Spotted Bear Preserve was abandoned in 1936 the same fear was present. That area still furnishes quality elk hunting today. Accurate monitoring of elk movements is possible only with marked animals. The Montana Department of Fish and Game, since 1937, has conducted an elk-marking program in the area. The presence of marked animals in the population will reflect any adverse elk movements, and hunting season boundaries and dates could be changed to rectify any undesirable migration pattern that might develop.

The beneficial impacts of elk hunting within the Preserve far outweigh the adverse impacts. If the Preserve were open for elk hunting the following favorable impacts would result:

1. The elk harvest could be achieved under quality hunting conditions on fall range and elk seasons extended after December 1, would be the exception rather than the rule.

2. Firing-line situations along the Preserve boundary and in Beaver Creek could be reduced or eliminated. Hunters would break up the large concentrations of elk which congregate along the Preserve boundary at present. There would be no sudden surge of a large elk herd through Beaver Creek as at present. Smaller groups of elk would be distributed more widely over the entire area.

3. Elk would be able to use fall ranges outside the Preserve boundary and potential winter range in the Preserve could recover from past overgrazing.

4. A number of elk are wounded outside the Preserve each year by hunters patrolling the firing line along the boundary. Some of these elk escape and die in the Preserve. Such losses would be reduced if the area were open to hunting.

5. The elk living to the east of the Preserve bear the brunt of the hunting pressure during seasons when the weather is too mild to force elk from the Preserve. A better balance in elk harvest would be beneficial to the elk herd by harvesting all segments of the herd and improving distribution, age structure, and productivity.

6. Better control of elk hunting would be possible under wilderness hunting conditions in the fall. The abrupt harvest and sudden influx of people into the easily accessible Beaver Creek area when the elk are migrating late in the season is very difficult to control properly. During extended seasons, the elk migration through Beaver Creek is often noted by news media. Since most of the other elk seasons are closed by this time, the news triggers an influx of previously unsuccessful elk hunters from population centers throughout Montana. Late season shoot-outs in Beaver Creek are certainly not a quality hunt by any stretch of the imagination.

Mule Deer:

Minimal impacts are expected on mule deer if the Sun River Game Preserve is opened to hunting. Few hunters will kill mule deer in inaccessible areas because it is easy to kill deer in areas accessible by vehicle.

White-tailed Deer:

The above statement also applies to white-tailed deer.

Grizzly Bear:

Opening the Preserve to hunting would increase the number of confrontations between grizzly bears and people within the Preserve area. An educational program would help minimize this problem.

Until more knowledge is gained about grizzly bear habitat and interactions of grizzly bears with people, it is recommended that if the Preserve is placed under Commission control, the area remain closed to grizzly bear hunting. Should public sentiment demand further restrictions on grizzly bear hunting if the Preserve is placed under Commission control, recommendations could be made to the Commission to close grizzly bear hunting in hunting districts 42, 424, and 425. This would not be a great hindrance to hunters as very few grizzly bears are taken in the area at the present time. Along with such a recommendation, more public education (such as Schneider, 1972) could be attempted to reduce the illegal kill of grizzly bears which is often

the result of undesirable practices by man. Legitimate complaints of bears endangering people or extensive property damage after proper bear-proofing methods were attempted could be handled by experienced Montana Department of Fish and Game personnel on a case by case basis. As indicated previously, the key to grizzly bear management over the long run is maintenance of the type of habitat that the grizzly bear requires.

If the hunting season were to remain closed for grizzly bears in the present Sun River Game Preserve or if it were also closed in hunting districts 42, 424 and 425, human and grizzly confrontations would increase. Bears unable to find and hold suitable territories in the wilderness areas would be forced to move to foothill areas and conflicts with livestock and cabin owners would increase. Public sentiment then would probably dictate that the grizzly bear season be opened for hunting to control the animals.

Rocky Mountain Goat:

People traveling through the Preserve in summer enjoy seeing mountain goats in their native habitat in readily accessible areas near main trails. Nonresident clients of outfitters in particular enjoy making goat observations. If hunting were allowed in the present Preserve, restrictions should be implemented to allow goat hunting only by limited permit and only a given distance from well-traveled trails. Portions of the area could be closed to goat hunting, or the entire area could remain closed to hunting of Rocky Mountain goats. The latter alternative ignores the laws of nature whereby a species reproduces itself in excess, and not hunting a species may be wasting surplus animals and recreation potential. However, at the present time, the recreation resulting from seeing relatively tame, unhunted goats from the main trails may be the primary recreation potential for part or all of the mountain goat population in the Sun River Game Preserve.

Bighorn Sheep:

Beneficial impacts could be expected on bighorn sheep if they were hunted under a limited permit system. Hunting of elk in the Preserve could result in better distribution of elk on fall ranges and an improvement in range in the lower West Fork and South Fork which would enable bighorn sheep to use it in winter. Outfitters and hunters would benefit from the opportunity for a quality bighorn sheep hunt in the Preserve area if it were opened to bighorn hunting. Bighorn sheep would be better able to utilize winter ranges in Sun River Canyon if they were not disturbed by elk hunters as in the long, extended seasons so common in the past.

Moose:

Impacts on moose would be minimal as moose permits are not being considered unless a change in habitat results in an increase in the moose population.

Black Bear:

Some increase in the black bear harvest might result, which would be desirable if it were spread over the entire area. The black bear habitat

in this relatively inaccessible area gives him a high degree of security. The black bear survived many years of hunting and trapping while listed as a predator.

Mountain Lion:

The necessity of dogs for hunting mountain lions and the inaccessible nature of the area coupled with the natural shyness of the mountain lion will result in minimal impact for this species if the Preserve is opened to hunting.

Game Birds:

Hunting of mountain grouse will be adjacent to trails and incidental with big game hunting. Minimal impacts are predicted for the three species of mountain grouse. While the season on ptarmigan is closed both outside and inside at present, if it were opened in the Preserve the impact would be negligible due to the terrain in which the bird lives.

Waterfowl:

The area is too inaccessible to be popular for waterfowl hunting so the impact on resident and migrating species will be minimal. Most hunters do not even pack a shotgun for their hunting trips in the vicinity of the Preserve at present.

Furbearers:

The area is open to trapping at present, and hunting in the Sun River Game Preserve will result in little additional take of furbearers. Most hunters will be hesitant to shoot furbearers for fear of damaging the hide and also the possibility of scaring the big game species being hunted.

Predators and Small Mammals:

Minimal impacts are expected for predators and small mammals if the Preserve is opened to hunting. If adverse effects result for a species, that species can be removed from the predator list and/or given furbearer or game animal status.

Birds other than Game Birds or Waterfowl:

Minimal impact is expected since most species are protected by State and Federal Law.

Fish:

Large numbers of saddle and pack stock could create heavy use of trails and stream crossings which could set the stage for increased siltation during periods of runoff. Use by saddle and pack stock could be minimized by enforcement of regulations or by using alternate trails away from streams.

Heavy grazing by saddle and pack stock near streams could result in erosion along stream banks. Such practices could be avoided by requiring these animals to graze away from streams.

The eastern boundary of the Sun River Game Preserve shows range abuse by big game animals. Overgrazing has occurred to a point that little vegetative cover remains in some areas. Siltation of streams is probably greater in this respect than would be experienced from additional saddle and pack stock use if the Preserve was opened to hunting. If the Preserve was opened to hunting, better distribution of big game animals would be realized since a "firing-line" situation would be minimized. Better distribution of big game animals would result in less use on abused areas and less siltation to streams in the area.

Pollution of water is possible from saddle and pack stock and human wastes and garbage too close to a stream or lake. These forms of pollution could be minimized through good judgment, law enforcement and educational programs.

Fishing pressure may increase but overfishing is unlikely since all of the streams and lakes in the area are open during the regular fishing season and receive moderate pressure. Natural reproduction has maintained the fishery under the existing fishing pressure. The numbers of sportsmen that would additionally utilize the fishery beyond the present summer use would be minimal.

## Unavoidable Adverse Effects

1. If the Preserve is opened to hunting there will be more people in the Preserve area than there are at present during the hunting season. Increased human use of the area will result in increased noise, air pollution from campfires, and greater possibility for man-caused fire and littering. All can be reduced but not completely eliminated by public education and law enforcement.

2. The chances will increase in the Preserve area for confrontations between grizzly bears and humans during the hunting season. Again, the problem can be reduced by common sense, public education and law enforcement, but not completely eliminated. A campaign to protect grizzly bears from illegal harvest and to provide as much wilderness habitat as possible will do more to help the grizzly bear than will efforts to exclude all hunting from the Sun River Game Preserve.

3. More recreation livestock will be used in the Preserve during the hunting season than at present. Some soil damage and vegetation utilization will result from increased use by domestic livestock. The problem can be controlled within acceptable limits by public education and law enforcement.

## Alternatives

One alternative is that the Sun River Game Preserve could remain with no hunting allowed. Present problems of game management and wilderness management would continue and could be expected to increase in the future.

Another alternative is that the Preserve could remain under legislative control with certain areas or species being hunted. This alternative is not consistent with past history because the legislature has designated the Montana Fish and Game Commission as the agency responsible for wildlife management in Montana.

Opening the Preserve to hunting for certain species or in certain areas would be modifications of the basic alternative of allowing hunting in the Preserve. For example, having a closed season on grizzly bears and mountain goats and opening the area for the other species would be a modification of an alternative. Likewise the various bag limits, season dates and boundaries would be modifications.

## Short-Term, Long-Term Use

As mentioned earlier, the first few years the Sun River Game Preserve is opened to hunting, restrictions will be necessary to minimize problems resulting from the influx of people that will come to hunt an area which has not been legally hunted for many years. The elk will soon adjust to the change from no hunting to hunting in the Preserve by becoming more wary.

To control the expected influx of people the first year, the season could be opened on antlered or branch-antlered bulls for the first few weeks to condition the elk population in the Preserve area to hunting and also to decrease the number of hunters. Most elk hunters prefer to hunt in general either-sex hunting districts. After the first few weeks the present cow-calf quota system could be effectively used to control the elk hunting. If the quota on cows and calves were reached in some years before the end of the general hunting season the hunting could be closed for cows and calves but remain open on antlered bulls until the end of the season.

Special permit elk hunting is not desired in the area. Every effort would be made to resist the need for use of special elk permits. A look at the hunting map shows that special elk permits are needed only in areas readily accessible by road. Fortunately, this is not the case for the Sun River area.

Data collected the first year the Preserve was opened for hunting would indicate the need for management programs in following years. It is expected that most elk hunters will find the densely timbered Sun River Game Preserve a difficult area in which to hunt elk.

Long-term management objectives for the elk are directed toward producing an optimum yield of elk, maintaining the highest quality hunting opportunity possible, attempting to insure relatively high calf production and yet maintain the extremely valuable wilderness hunting conditions.

Other long-range goals are to regulate the elk population to achieve the most desirable range conditions and optimum relationships with other big game species and livestock. A continuing program is in effect to maintain and increase available range for elk.

A number of options have already been discussed for grizzly bear management should the Preserve be opened for hunting. Long-term goals are to protect the wilderness habitat which is vital for the survival of the grizzly bear in Montana and to maintain a grizzly bear population and provide hunting opportunities to sportsmen.

Mountain goat hunting could be established by permit in the Sun River Game Preserve area after careful studies show the condition of the mountain goat range, the population structure and distribution and movements of mountain goats to the permit area west of the Continental Divide. The value of observing relatively tame mountain goats near main trails must be considered, particularly in regard to wilderness users.

Bighorn sheep could be hunted under a limited permit system that is currently used for the area to the east of the Preserve. Studies are under way to define distinct populations of bighorns and the one large hunting district at present will probably be divided into several smaller units in the future. Long-term goals are to maintain hunting for large rams and also to balance the population with available range by hunter harvest of female bighorn sheep.

If the Preserve is opened to hunting, no problems are foreseen for other game and bird species which could be managed under the same system as the surrounding areas. If problems did arise, they could be detected through careful monitoring of the situation and hunting regulations could be changed accordingly.

Short-term and long-term management goals for wilderness are to fulfill the requirements of the Wilderness Act of 1964 and any future guidelines by Congress. As with wildlife, an increased effort in data collecting and law enforcement will be necessary the first few years the Sun River Game Preserve is opened to hunting. People use of the Preserve will be approached with a conservative attitude to assure that wilderness values are not significantly affected by increased recreation use. The first year the area was opened, hunters and outfitters would probably be required to camp outside the Preserve so that the situation could be assessed more accurately. Camping permits will undoubtedly be required for wilderness users soon regardless of whether the Sun River Game Preserve is opened to hunting.

## Irreversible and Irretrievable Commitment of Resources

If the Sun River Game Preserve is opened to hunting no irreversible or irretrievable commitment of resources is expected. On the other hand if concentrations of elk continue to abuse the range and the soil in the Preserve, damage could result which would be irreversible and irretrievable in the life time of many young elk hunters. Depending on the extent of the soil damage,

the healing process could take centuries. Lowdermilk (1953) very capably describes the process of soil erosion.

## Discussion of Problems and Objections by Other Agencies or the Public

The Sun River Game Preserve has been surrounded by controversy and misconception since it was established in 1913. In recent years, the news media has added to the controversy by confusing the Sun River Game Preserve with the Sun River Game Range. The Montana Fish and Game Commission considers the Sun River Game Range a vital link in the lives of the elk and recommends no changes in its current status. Headlines such as "Fish-Game Favors Abolishing Controversial Sun River Range", add fuel to the controversy and help create misconceptions. The Montana Department of Fish and Game is not abolishing elk range. In reality, every effort is being made to maintain and increase quality elk range.

Opposition to eliminating the Sun River Game Preserve will be forthcoming from outfitter interests, some local businessmen, and some sportsmen's groups who have indicated they will oppose any changes in the Sun River Game Preserve.

Some people may oppose the proposed change because they misunderstand the difference between the Sun River Game Preserve and the Sun River Game Range.

## BENEFITS

A number of benefits are possible if the Sun River Game Preserve is placed under the control of the Montana Fish and Game Commission and opened to hunting.

1. The elk harvest could be achieved under quality hunting conditions on fall range and elk seasons extending past December 1, would be the exception rather than the rule.

2. Firing-line situations along the Preserve boundary and in Beaver Creek could be reduced or eliminated. Hunters would break up the large concentrations of elk which congregate along the Preserve boundary at present. There would be no sudden surge of a large elk herd through Beaver Creek as at present. Smaller groups of elk would be distributed more widely over the whole area.

3. Elk would be able to use fall ranges outside the Preserve boundary and potential winter range in the Preserve could recover from the overgrazing which has occurred in the fall.

4. A number of elk are wounded outside the Preserve each year by hunters patrolling the firing line along the boundary. Some of these elk escape and die in the Preserve. Such losses would be reduced if the area were open to hunting.

5. The elk living to the east of the Preserve bear the brunt of the hunting pressure during seasons when the weather is too mild to force the elk from the Preserve. A better balance in elk harvest would be beneficial to the elk herd.

6. Better control of elk hunting would be possible under wilderness hunting conditions in the fall. The abrupt harvest and sudden influx of people into the easily accessible Beaver Creek area when large herds of elk are migrating late in the season is very difficult to control properly.

7. Good elk hunting would be available throughout the season rather than just the first few days and at the end of the season as at present.

8. In addition to elk hunting, hunters will benefit from the opportunity to hunt the other game animal and game bird species in the Preserve under regulations which will maintain an optimum annual yield for each species.

9. Frustrations and safety hazards of present firing lines will be reduced or eliminated.

10. If the Preserve is opened to hunting, a better dispersion of hunters will be possible which will be beneficial to the valuable wilderness resource.

## SUMMARY STATEMENT

The Montana Fish and Game Commission has the responsibility for perpetuating the State's wildlife resource as well as providing for its wise utilization. This Environmental Impact Statement has reviewed the expected or possible effects of placing the Sun River Game Preserve under the control of the Montana Fish and Game Commission.

The environmental impacts created by the presence of the Sun River Game Preserve are primarily associated with the activities of hunters, outfitters, recreation livestock, and the problems associated with wildlife management (particularly elk, grizzly bear, mountain goats and bighorn sheep) and management of the extremely valuable wilderness resource by the U. S. Forest Service. If the Preserve is eliminated, no major problems are expected that will result in significant detrimental effects to the air, soil, water, human resources, land use, wildlife or vegetation. Certain minor, short-term adverse effects to some aspects of wildlife and wilderness management can be expected. Many of these can be minimized by continued educational programs and regulation. Effects on humans will be primarily beneficial. Opportunities for a quality hunting experience will be provided in a wilderness environment throughout the hunting season. Frustration and safety hazards of the present firing lines will be reduced or eliminated. The wildlife, vegetation and wilderness resources will benefit from better management practices if the management options are available to the agencies having the management responsibilities.

The process of proper game management is such that there will probably always be some degree of discontent from the public regarding the operation. Probably most disconcerting are those who disagree with the concept of regulated hunting as a natural form of human recreation and in their opposition fail to recognize that scientific game management has as its goal the perpetuation of wildlife resources for the benefit of all mankind.

# APPENDIX

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FIGURE I. SUN RIVER GAME PRESERVE AND VICINITY

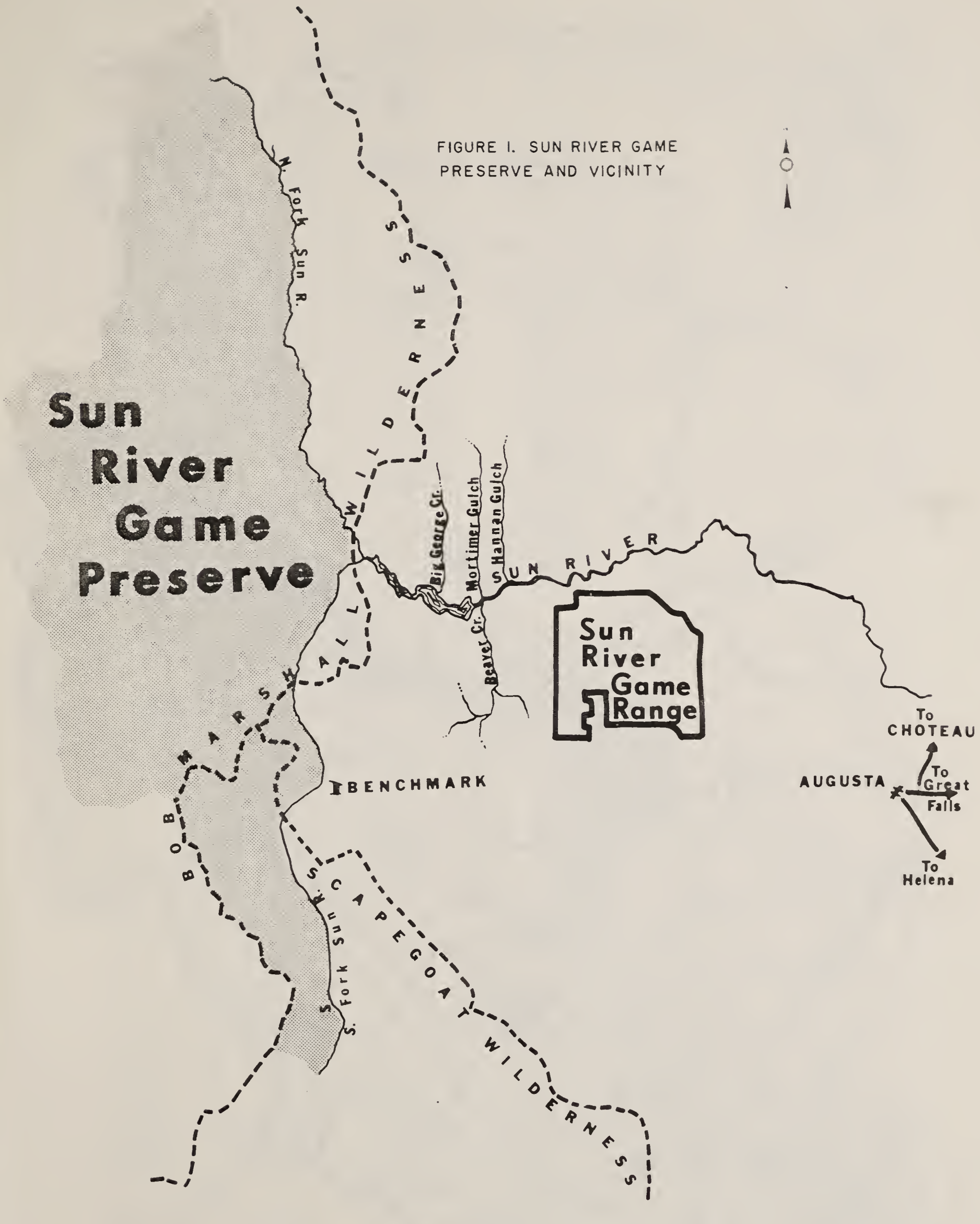


FIGURE 2. PRESENT WINTER RANGE
OF ELK & BIGHORN SHEEP

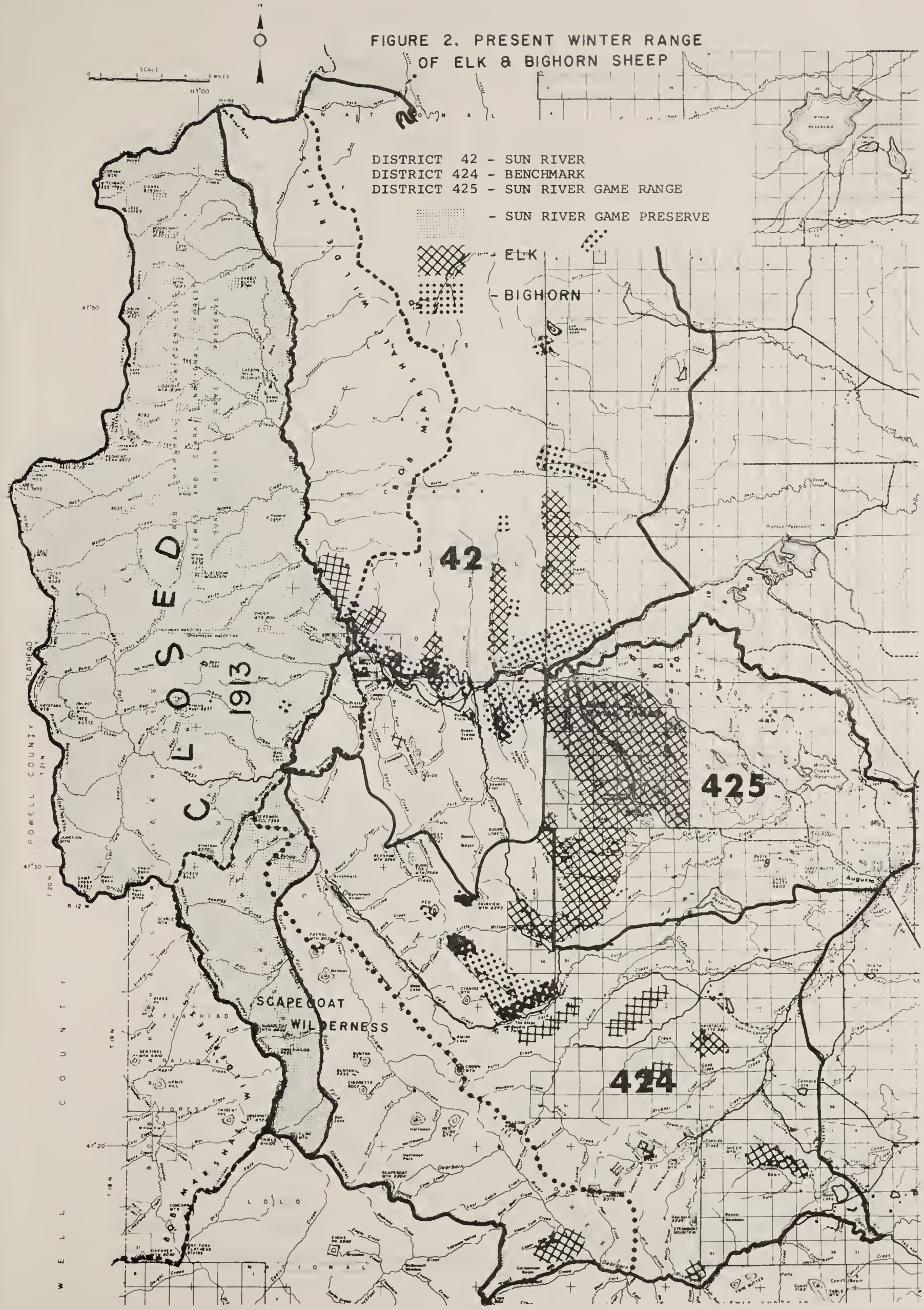


FIGURE 3. FIRE HISTORY OF AREA 1910-1970

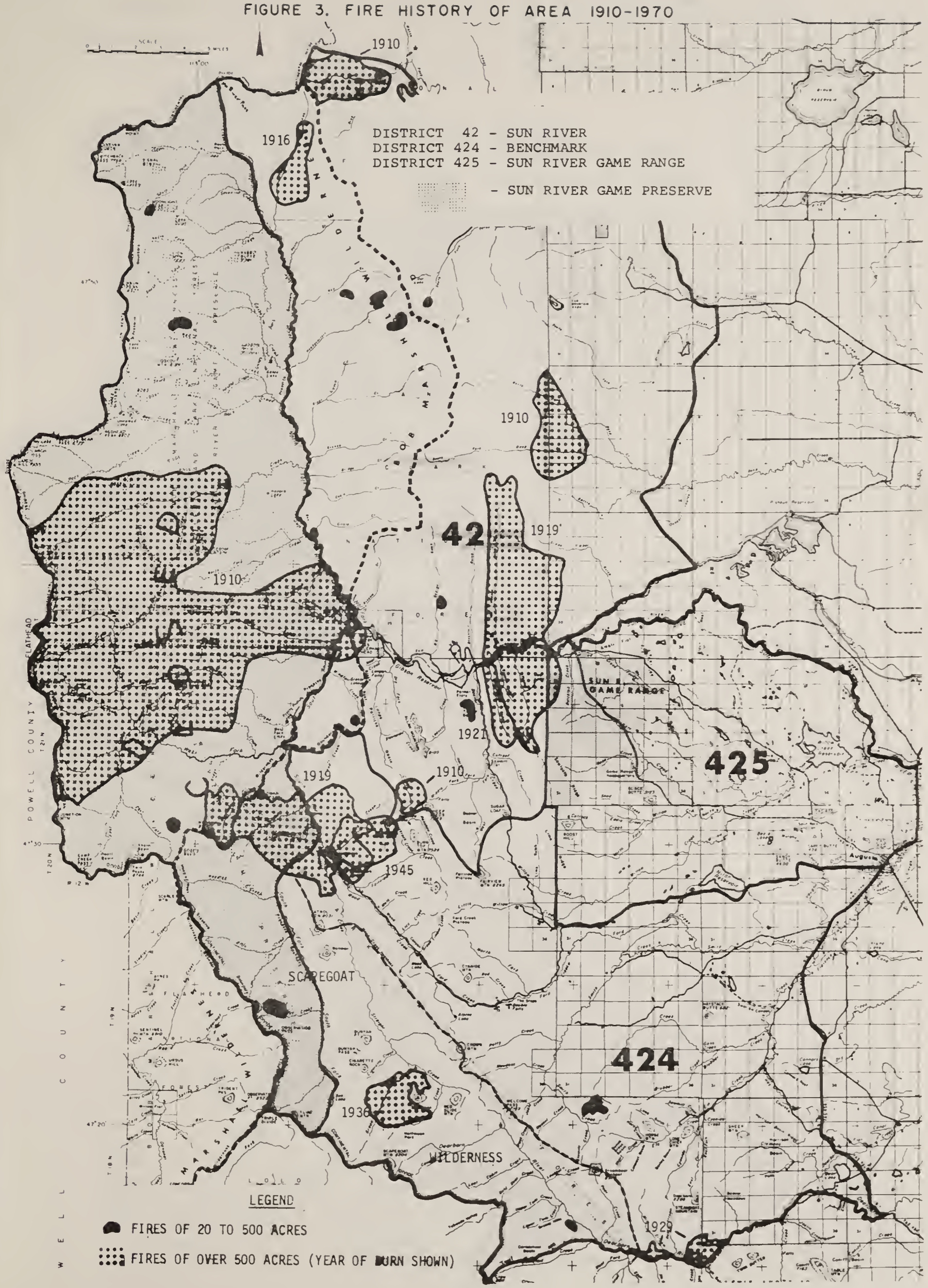


FIGURE 4. GENERAL VEGETATION PATTERN IN SUN RIVER AREA IN 1972

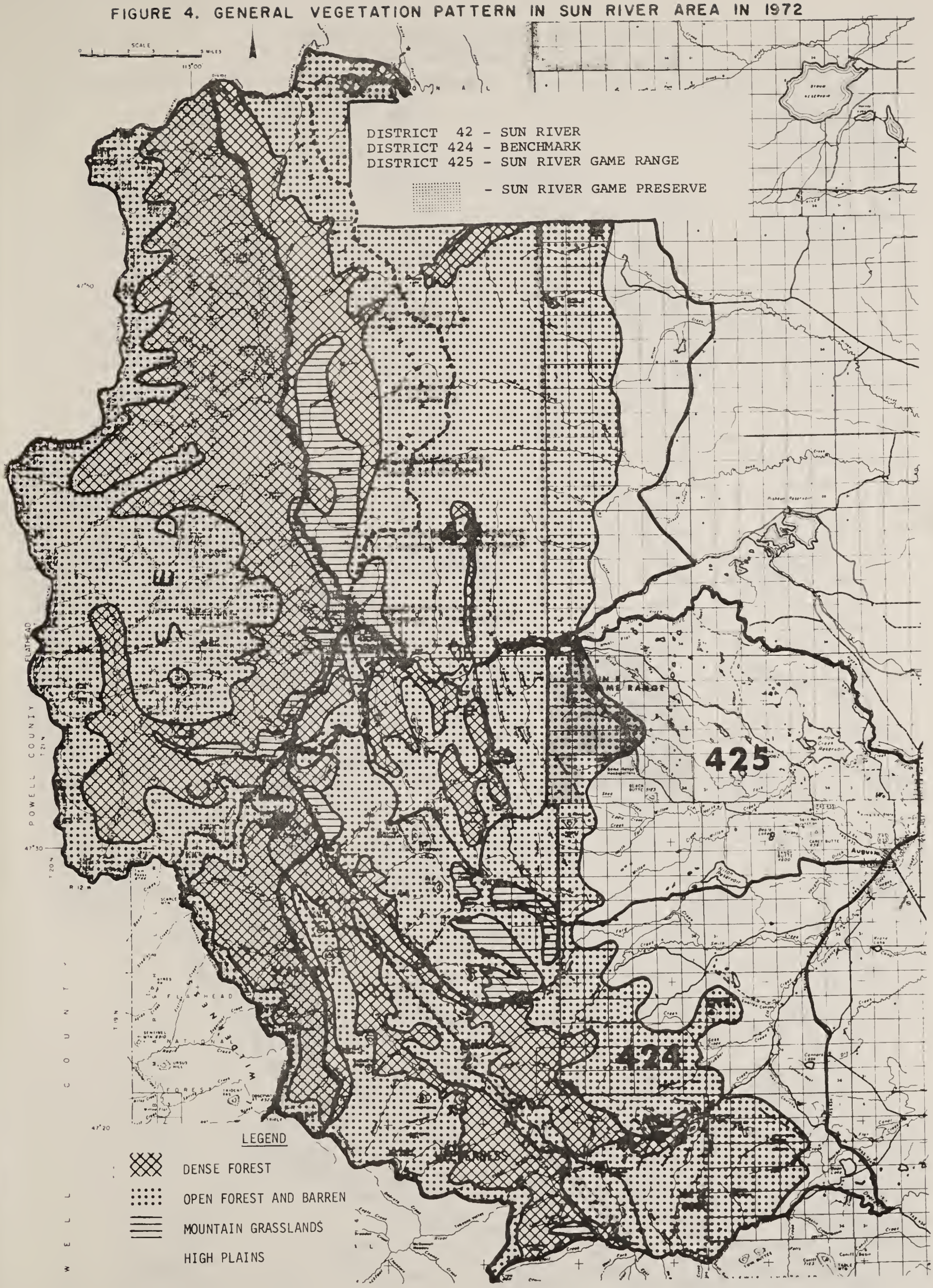


FIGURE 5. AVERAGE PRECIPITATION ISOLINES
FOR 10 INCH INTERVALS FOR 1953-1967

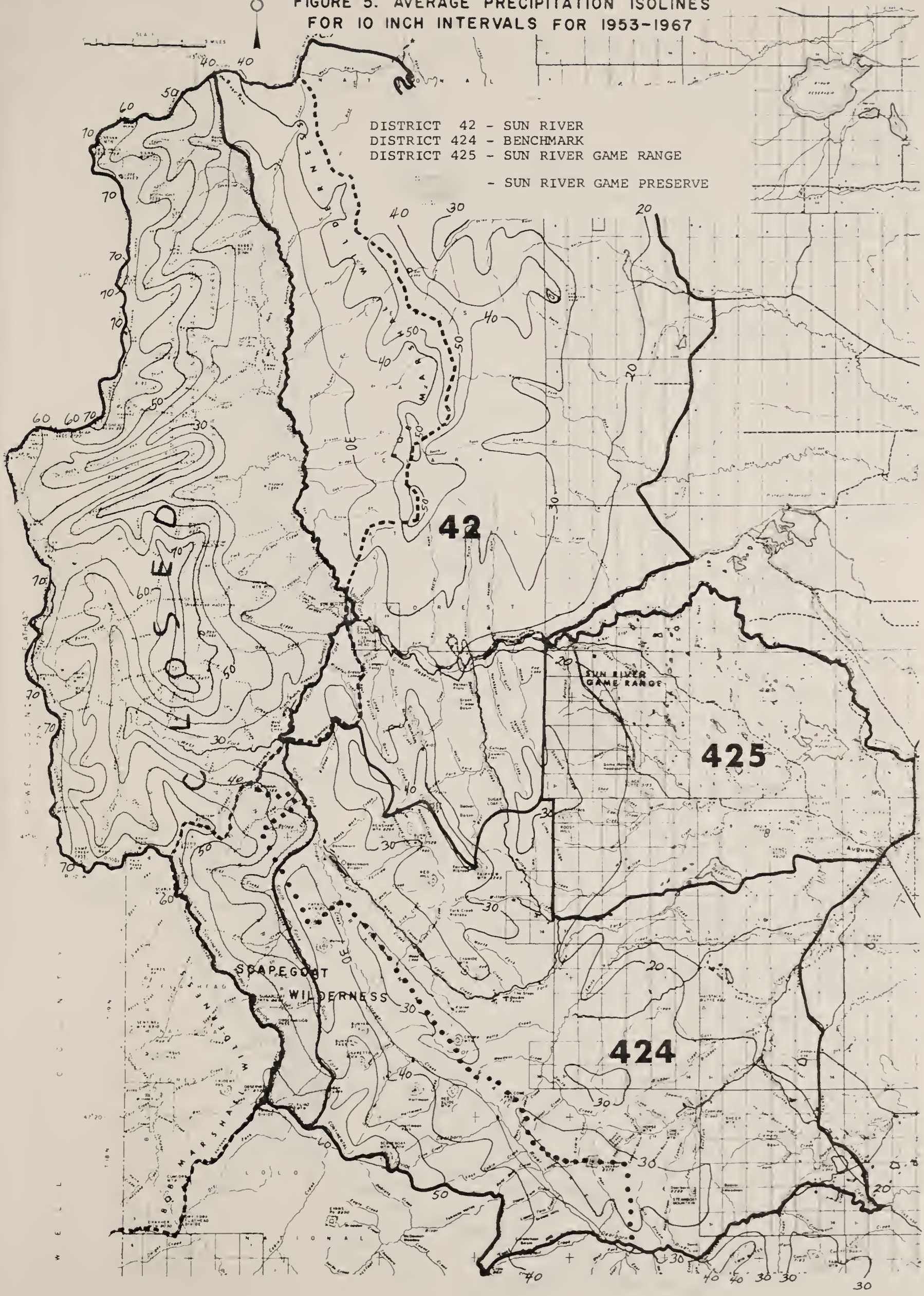
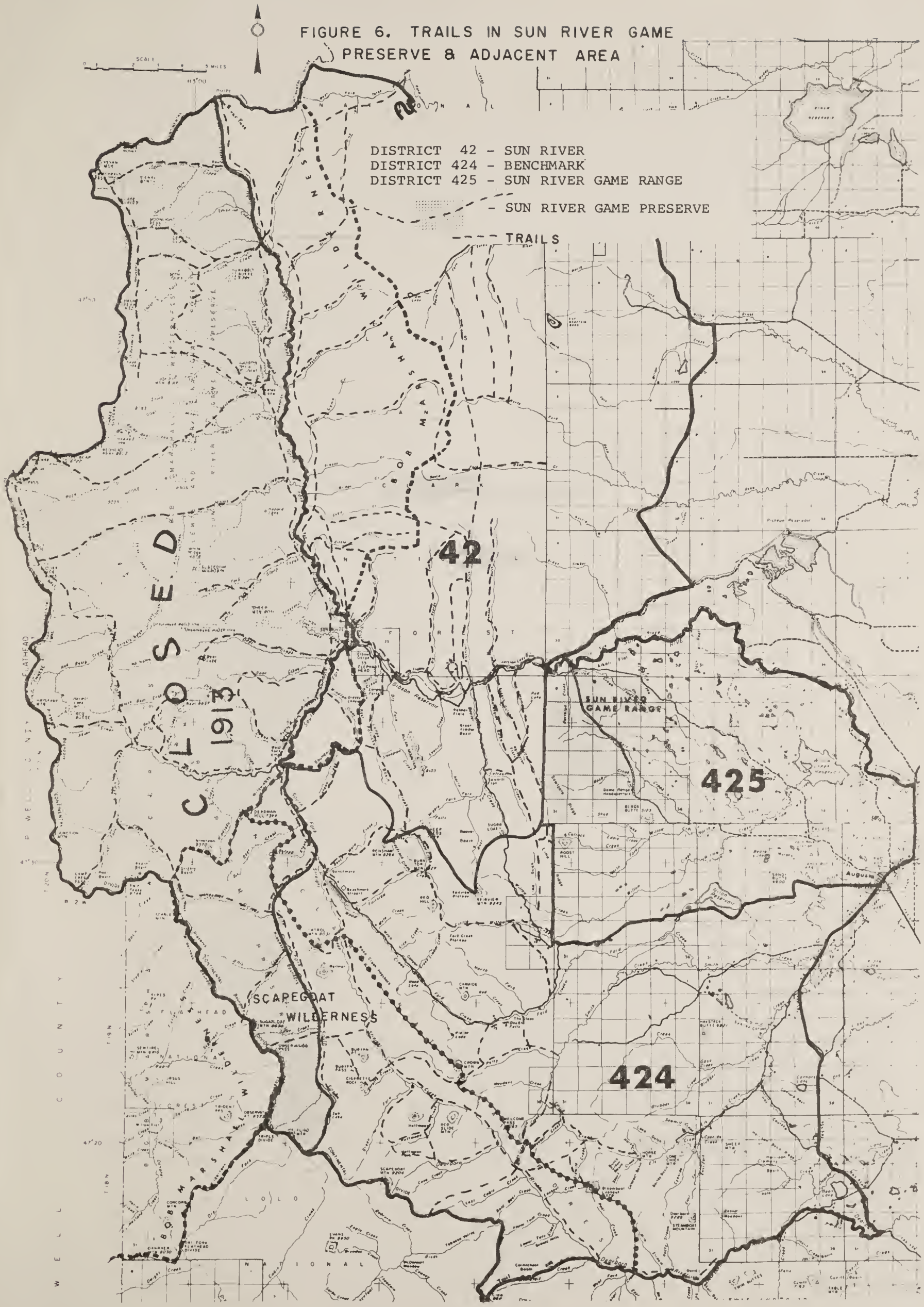


FIGURE 6. TRAILS IN SUN RIVER GAME PRESERVE & ADJACENT AREA



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